



CONTRA COSTA
**transportation
 authority**

COMMISSIONERS

Don Tatzin, Chair

Janet Abelson,
 Vice Chair

Genoveva Calloway

David Durant

Jim Frazier

Federal Glover

Dave Hudson

Karen Mitchoff

JuFe Pierce

Karen Stepper

Robert Taylor

Randell H. Iwasaki,
 Executive Director

April 16, 2012

To: All Interested Parties

From: Martin R. Engelmann, Deputy Executive Director, Planning *MRE*

RE: Distribution of the SR-4 Integrated Corridor Analysis – Public Review Draft

This letter is to announce the release of the State Route (SR) 4 Integrated Corridor Analysis (ICA) – Public Review Draft, prepared by the ATKINS North America consultant team, with funding and oversight by CCTA. The purpose of the SR-4 ICA is to:

- 1) Identify and prioritize previously identified projects along the corridor;
- 2) Develop and evaluate new projects, including transit options and arterial operational improvements;
- 3) Advances local community goals for Priority Development Areas (PDAs) along the corridor; and
- 4) Establish a consistent set of Multi-Modal Transportation Service Objectives (MTSOs) for incorporation into future Action Plan updates.

The Draft SR-4 ICA is available for download at www.ccta.net (from the home page, click on "Current Activities"). Printed copies of the report are available on a limited basis upon request. Please direct your comments or requests to Diane Bodon, Planning Assistant at CCTA (925-256-4720 | dbodon@ccta.net).

Comments are due by Thursday, May 31, 2012.

We appreciate your interest and look forward to your continued involvement in the SR-4 ICA.

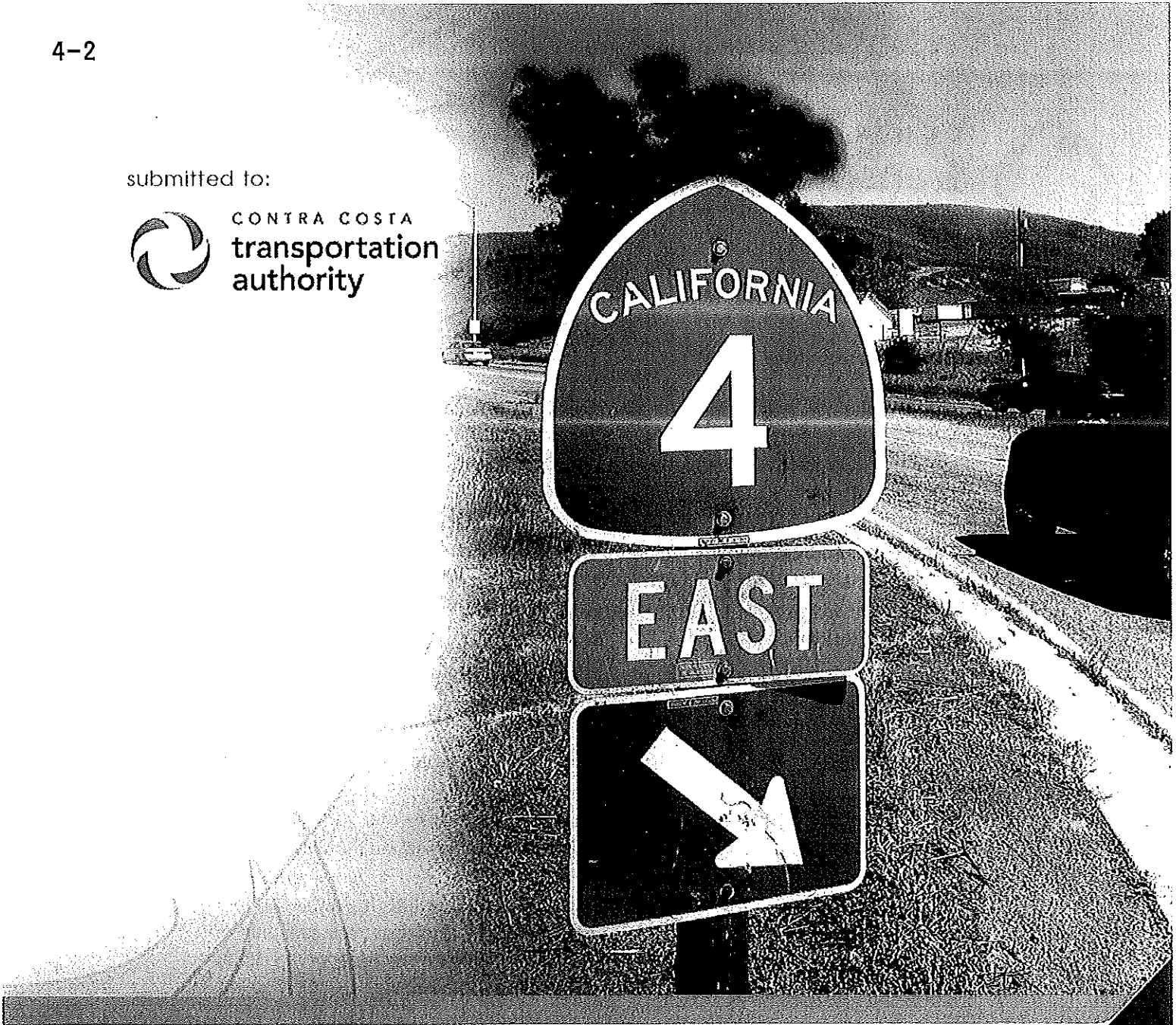
2999 Oak Road
 Suite 100
 Walnut Creek
 CA 94597
 PHONE: 925.256.4700
 FAX: 925.256.4701
www.ccta.net

cc: RTPC Managers; SR-4 C-TAC; SR-4 C-PAC, Corridor City Managers and Public Works Directors (Hercules, Martinez, Concord, Pittsburg, Antioch, Oakley, Brentwood); Contra Costa County Administrator and Public Works Director

submitted to:



CONTRA COSTA
transportation
authority



SR-4 Integrated Corridor Analysis

April 12, 2012

Public Review Draft

ATKINS

SR-4 Integrated Corridor Analysis

Public Review Draft

Prepared for:

Contra Costa Transportation Authority
2999 Oak Road, Suite 100
Walnut Creek, California 94597

Prepared by:

ATKINS

475 Sansome Street, Suite 2000
San Francisco, CA 94111

April 12, 2012

Contents

SECTION 1: SR-4 INTEGRATED CORRIDOR ANALYSIS INTRODUCTION	1
Geographic Setting	1
Regional Transportation Planning Committees	1
Stakeholder Engagement	2
Methodology	3
Corridor Description	3
Major Arterials	3
Goods Movement	3
Transit	4
Bicycle and Pedestrian Network	4
Intelligent Transportation System (ITS) and Detection	4
Land Use & Major Traffic Generators	4
Priority Development Areas	5
Environmental Constraints/Factors	5
Projects	6
West County	6
Central County	7
East County	7
SECTION 2: PERFORMANCE ASSESSMENT MEASURES	15
Quantitative Measures	15
Average Speed (mph) and Average Travel Time (min)	15
Annual Reductions in Total Delay	16
Project Cost and Cost Effectiveness	16
Qualitative Measures	16
System Continuity	16
Improve Multimodal Access, Mobility, and Reliability	17
Sustainable Community Strategy (SCS) and Community Goals	17
SECTION 3: CORRIDOR PERFORMANCE RESULTS	19
West County Performance Assessment	19
Short-Term 2015 – 2020	19
Long-Term 2020 – 2030	19
Central County Performance Assessment	20
Short-Term 2015 – 2020	20
Long-Term 2020 – 2030	20
East County Performance Assessment	29
Short-Term 2015 – 2020	29
Long-Term 2020 – 2030	29
SECTION 4: MULTIMODAL TRANSPORTATION SERVICE OBJECTIVES	35
Overview of Performance Measures	35
Level of Service (LOS)	35
Delay Index	35
West County	36
Central County	37
East County	37
SECTION 5: RECOMMENDATIONS/CONCLUSIONS	39
Total Project Costs	39
Implementation Considerations	41
MTSOs and Action Plans	41
Next Steps	41
Appendices	43
Appendix A: Summary of Existing Studies	45
Appendix B: Evaluation Matrix	47

Appendices

Appendix A: Summary of Existing Studies

Appendix B: Evaluation Matrix

List of Tables

Table 1	SR-4 Corridor PDAs	5
Table 2	Future Baseline Conditions	15
Table 3	Short-Term West County Projects	21
Table 4	Long-Term West County Projects	23
Table 5	Short-Term Central County Projects	25
Table 6	Long-Term Central County Projects	27
Table 7	Short-Term East County Projects	31
Table 8	Long-Term East County Projects	33
Table 9	West County LOS	36
Table 10	Central County Delay Index	37
Table 11	East County Delay Index	38
Table 12	Total Cost for All Projects (2011\$ - millions)	39

List of Figures

Figure 1	West County Project Strategies	8
Figure 2	West and Central County Project Strategies	9
Figure 3	Central County Project Strategies	10
Figure 4	Central and East County Project Strategies	11
Figure 5	Central and East County Project Strategies	12
Figure 6	East County Project Strategies	13
Figure 7	East County Project Strategies	14
Figure 8	Lane Diagram of Proposed Scenario 5	40

Section 1: SR-4 Integrated Corridor Analysis Introduction

Three of the Regional Transportation Planning Committees (RTPCs) (West, Central, and East) in Contra Costa adopted an action in their respective Action Plans to develop a corridor management plan for SR-4 from I-80 in the City of Hercules to SR-160 in the City of Antioch. As a follow-on document to the State Route (SR-4) Freeway Performance Initiative (FPI)/Corridor System Management Plan (CSMP), the SR-4 Integrated Corridor Analysis (ICA) represents the next step in supporting the Governor's Strategic Growth Plan (CGP), as well as ensuring consistency between the CSMP and local planning efforts in West, Central, and East Contra Costa County. More specifically, the purpose of the SR-4 ICA is to coordinate the three Action Plans for SR-4 (West, Central, and East) into a cohesive corridor plan that:

- 1) identifies and prioritizes previously identified projects along the corridor;
- 2) advances local community goals for Priority Development Areas (PDAs) along the corridor; and
- 3) recommends a Multi-modal Transportation Service Objective (MTSO) for SR-4.

Geographic Setting

The western limit of SR-4 is the I-80/SR-4 interchange in the City of Hercules, and the corridor extends eastward, ending at the SR-4/SR-160 interchange in the City of Antioch. The corridor is characterized by its rolling topography between I-80 and I-680, its suburban land uses eastward of the I-680 interchange. The corridor lane configuration varies between four and seven mixed-flow lanes and approximately four miles of bi-directional High-Occupancy Vehicle (HOV) lanes. Two mainline capacity improvements to the SR-4 corridor system are either planned or under construction within the corridor: the SR-4 East Widening Project (Loveridge Road to SR-160) and Segment 3 of the SR-4 Bypass (Marsh Creek Road to Vasco Road).

Regional Transportation Planning Committees

There are four RTPCs in Contra Costa: the West Contra Costa Transportation Advisory Committee (WCCTAC) in West County, Transportation Partnership and Cooperation Committee (TRANSPAC) in Central County, Transportation Planning Committee (TRANSPLAN) in East County, and the Southwest Area Transportation Committee (SWAT) which includes both the Lamorinda and Danville-San Ramon areas. The County represents unincorporated areas on each RTPC. These RTPCs are made up of elected and appointed representatives from each jurisdiction within that region. Officials from transit agencies and planning commissions also serve on some of the RTPCs, either as voting or ex-officio members. Each RTPC is also assisted by a Technical Advisory Committee made up of planning and engineering staff from the jurisdictions. The SR-4 corridor is located in three planning areas: West, Central, and East.

West

The West planning area is comprised of the following jurisdictions: El Cerrito, Hercules, Pinole, Richmond, San Pablo, and Contra Costa County.

Central

The Central planning area is comprised of the following jurisdictions: Clayton, Concord, Martinez, Pleasant Hill, Walnut Creek, and Contra Costa County.

East

The East planning area is comprised of the following jurisdictions: Antioch, Brentwood, Oakley, Pittsburg, and Contra Costa County.

Stakeholder Engagement

At the outset of the SR-4 ICA, two advisory committees were established to help guide the work. Each met periodically throughout the SR-4 ICA. The committees were briefed on progress and asked to provide feedback and input on appropriate next steps.

The Corridor Technical Advisory Committee (C-TAC) was formed to ensure full participation of local staff in the preparation of the SR-4 ICA. The C-TAC was primarily composed of transportation planners and engineers from the affected jurisdiction along the corridor plus CCTA staff and representatives from Caltrans. Additional organizations invited to participate included the Metropolitan Transportation Commission (MTC), Bay Area Rapid Transit (BART), Alameda-Contra Costa Transit (AC Transit), Tri Delta Transit, County Connection, and WestCAT.

The Corridor Policy Advisory Committee (C-PAC) was designed to ensure participation of local elected officials in the decisions made regarding the SR-4 ICA. Each of the following RTPC appointed two elected:

- WCCTAC
- TRANSPAC
- TRANSPLAN

Methodology

In conjunction with the members of the C-TAC and C-PAC, the study team compiled a list of all known and potential projects in the corridor. The study team then analyzed each project's cost and benefits. The projects were divided into Short-Term and Long-Term projects depending on whether they could reasonably be implemented in a near-term planning horizon (2015-2020), or would require a longer implementation lead-time (2020-2030). Projects were also grouped by planning area: West, Central, and East.

Stakeholders also provided input on recommended qualitative and quantitative metrics to be used in evaluating each of the projects. The study team used a matrix approach to document the qualitative benefits of each project and applied computer models to develop the quantitative metrics. Each project was evaluated against future baseline conditions consistent with its designation as a Short-Term (2015-2020) or Long-Term (2020-2030) project. The study team also quantified the impact of the full set of proposed projects on MTSOs in each planning area.

Corridor Description

The SR-4 corridor is an east-west route approximately 31 miles in length providing interregional travel between the Central Valley and Bay Area for commute, recreational and commercial traffic. It also serves a significant level of locally generated demand from the cities located along the corridor such as Hercules, Martinez, Concord, Pittsburg, Antioch, Brentwood, and Unincorporated Contra Costa County.

The SR-4 corridor is on the National Highway System (NHS) as a basic route. It is functionally classified as both an Urban Principal Arterial and as expressway-freeway in different segments due to changes in access along its 31 mile stretch. The SR-4 corridor is on the Surface Transportation Assistance Act (STAA) and the State Highway Extra Legal Load (SHELL) network. SR-4 is a designated Route of Regional Significance in the Countywide Transportation Plan. SR-4 falls within the jurisdiction of MTC, Caltrans District 4, and Bay Area Air Quality Management District (BAAQMD).

Major Arterials

There is an extensive network of arterial roadways and local streets that provide access to SR-4 and serve local travel throughout the corridor. These include Willow Pass Road and Port Chicago Highway in Concord, the Pittsburg-Antioch Highway, West Leland Road and Buchanan Road in Pittsburg, and 18th Street in Antioch. These arterials may also unofficially serve as alternative routings during major incidents on SR-4.

Goods Movement

The SR-4 corridor serves local and intercity truck and heavy vehicle travel for surrounding communities such as Hercules, Martinez, Concord, Pittsburg, Antioch, Oakley, and Brentwood. Additionally, it provides access to I-80, the second longest interstate route in the U.S., and a major route for interstate commerce.¹ Truck and heavy vehicle traffic makes up four to seven percent of daily vehicle trips along the SR-4 corridor.²

¹ The Dwight D. Eisenhower National System of Interstate and Defense Highways. Federal Highway Administration (FHWA). November 2002. <http://www.fhwa.dot.gov/reports/routefinder/index.htm>

² 2007 Truck AADT. Traffic Data Branch. Caltrans. <http://www.dot.ca.gov/hq/traffops/saferesr/trafdata>

Transit

The SR-4 corridor includes interstate and regional rail, express and local bus service within Contra Costa County (specifically Antioch, Brentwood, Concord, Hercules, Martinez, and Pittsburg). The major providers are Amtrak (Capitol Corridor service), BART, WestCAT, Central Contra Costa Transit Authority (CCCTA) and Tri Delta Transit. A total of six Park & Ride facilities are located along the corridor that serve as pick-up/drop-off points for the three bus operators in the corridor, WestCAT, CCCTA, and Tri Delta Transit. In addition, the first phase of eBART is now under construction from Pittsburg/Bay Point BART to Hillcrest Avenue in Antioch.

Bicycle and Pedestrian Network

The SR-4 corridor allows bicycle shoulder access between San Pablo Avenue and Cummings Skyway and Port Chicago Highway and Willow Pass Road, but no pedestrian access. Bicyclists and pedestrians may travel parallel to SR-4 on the remaining segments of SR-4 using local arterials. These provide access to local job centers, shopping centers, K-12 schools, colleges, and transit stations. Bicycle facility types include Class-I (multi-use), Class-II (bicycle lane) and Class-III (bicycle route). BART stations and Park and Ride lots within the corridor provide bicycle parking and storage facilities. Pedestrian walkways are present across SR-4 at Bailey Road, Railroad Avenue and Hillcrest Avenue in Pittsburg and Antioch.

Intelligent Transportation System (ITS) and Detection

Current ITS infrastructure within the SR-4 corridor includes Ramp Metering (RM) Stations, Traffic Monitoring Stations (TMS), Wireless Magnetometer Vehicle Detection Stations, Changeable Message Signs (CMS), Highway Advisory Radio (HAR), Extinguishable Message Signs (EMS), and Closed-Circuit Television (CCTV) cameras. Caltrans strives for traffic detection to be located at one-third to one half-mile intervals along the corridor. This has been recently achieved with the filling of key gaps in the detection network between I-80 and SR-242, and between Loveridge Road and SR-160.

Land Use & Major Traffic Generators

The SR-4 corridor illustrates a variety of land-uses traveling between the cities of Hercules and Antioch. Low-intensity commercial and residential land-uses are present throughout the suburban landscape of Hercules. As you travel east the landscape fluctuates between watershed, open space, and recreational uses before transitioning to low to moderate levels of residential, commercial and retail environments.

The SR-4 corridor is critical in accommodating longer vehicle trips through Contra Costa County. A larger proportion of vehicle trips along the corridor originate in the suburbs of East Contra Costa County with destinations outside the corridor. Destinations include job centers, airports and entertainment centers located in Central Contra Costa County, Oakland and San Francisco. Land-uses featuring educational institutions, local and regional shopping centers and low-density commercial and retail along and adjacent to the corridor provide significant trip generation along the corridor. Other contributing factors to travel demand in the corridor include interregional and local routes providing network connectivity and access.

Priority Development Areas

In the summer of 2007, local governments in the Bay Area were invited to apply for regional designation of an area within their community as a Priority Development Area (PDA). PDAs are infill development opportunities within existing communities. In the context of SB 375, the PDAs are intended to reduce Greenhouse Gas (GHG) emissions by creating more housing choices in locations easily accessible to transit, jobs, shopping and services. In order to become a planned PDA, an area needs to be within an existing community, near existing or planned fixed transit or served by comparable bus service, and planned for more housing. In 2010, ABAG clarified the definition of "being near transit" to include a threshold for regular bus service of at least every 20 minutes during peak periods. To meet the transit criteria, planned transit stations also had to be identified in the MTC/s Resolution 3434. The transit criteria were further refined to ensure that PDAs were in transit accessible locations.

A potential PDA area may be envisioned as a potential planning area that is not currently identified in a plan or may be part of an existing plan that requires changes. Table 1 lists the potential and planned PDAs along the SR-4 corridor.

Table 1 - SR-4 Corridor PDAs

PDA	Designation
City of Hercules: <i>Central Hercules & Waterfront District</i>	Planned
City of Martinez: <i>Downtown Martinez Intermodal Station Area</i>	Planned
City of Pittsburg: <i>Downtown</i>	Planned
Contra Costa County: <i>Pittsburg/ Bay Point BART Station Area</i>	Planned
City of Concord: <i>Community Reuse Area</i>	Potential
WCCTAC: <i>Pablo Avenue</i>	Planned/Potential
City of Pittsburg: <i>Railroad Avenue eBART Station Area</i>	Potential
City of Antioch: <i>Hillcrest eBART Station Area & Rivertown Waterfront</i>	Potential
City of Oakley: <i>Downtown Focus Area, Employment Focus Area, & Potential Planning Area</i>	Potential

Environmental Constraints/Factors

Portions of SR-4 are in a 100-year flood plain, limiting allowable activities in floodplains unless it is the only practicable alternative. The SR-4 corridor traverses many resource rich areas over its 31 miles. Nine historical bridges are identified along the corridor with a majority of them existing in the older eastern segments of the corridor. Hazardous sites (underground tanks) are also identified along the corridor with the majority clustered around the refinery complexes found near the center and eastern segments of the corridor. Numerous habitats supporting threatened or endangered species are present throughout the corridor with the largest concentrations found near the eastern segments of the corridor nearest the Delta. The Carquinez Strait Regional Shoreline Park and the Black Diamond Mines Regional Preserve are adjacent to the center and eastern segments of the corridor and are considered protected open-space.

Projects

With the assistance of the C-TAC and C-PAC, the study team identified a comprehensive list of all planned and proposed projects³ in the SR-4 corridor. The study team consulted the CSMP as well as a variety of published planning documents in order to identify capital improvements and future operational changes that were relevant to the corridor. Source documents included both project-level studies and area-wide strategic plans produced by jurisdictions along the corridor, the RTPCs, CCTA, MTC, and area transit agencies such as BART, Capitol Corridor, and WestCAT. A summary of the existing studies that were reviewed for this analysis is provided in Appendix A.

The projects were divided into Short-Term and Long-Term projects. Short-Term projects were those that could reasonably be implemented within a near term planning horizon (2015-2020). This group included any projects that are already well advanced in planning, environmental analysis, and/or design, as well as smaller or simpler projects that would not require significant construction time or complex coordination. All other projects were placed into the Long-Term projects group, reflecting the assumption that implementation was more likely to occur a bit further in the future, closer to 2020-2030.

Any identified projects that were noted as approved and fully funded were considered part of the Short-Term future baseline. The remaining projects were listed as potential projects and presented to the stakeholder groups for feedback and refinement. Once the complete list of potential projects was formed, a cost estimate was specified for each project. In most cases, cost estimates were based directly on information contained in the published documents describing the particular project. One major set of projects, known as Scenario 5, required additional engineering and design work to establish a detailed definition and cost estimate. Additional information about project cost estimates is included in Appendix B.

Projects were grouped by planning area: West, Central, and East. In addition, projects that were logically interdependent were grouped together, so that they could be analyzed as one project during the performance assessment. Specifically, projects were grouped based on the likelihood that the various project components would be constructed simultaneously (e.g., SR-4 widening projects in both eastbound and westbound directions) or when projects can be grouped into a single program (e.g., ramp metering). Each section below discusses the final list of Short-Term and Long-Term projects in each planning area, including a detailed project listing and locator maps.

West County

Two sets of projects for West County were carried forward directly from the CSMP: West County ITS Installations (FPI/CSMP #1-3) and West County Ramp Metering (FPI/CSMP #13-14). Consistent with the low levels of congestion currently seen on SR-4 in West County, the remainder of the Short-Term projects focuses on enhancing transit connections to and through SR-4. Figure 1 shows the Short-Term and Long-Term projects for West County.

³ For the purposes of this report, "projects" refers to capital improvement projects, operational projects, and transportation mitigation programs, actions, measures and projects aimed at improving corridor performance.

Central County

A total of eight improvements for Central County were brought forward from the CSMP. Grouped within projects, they are:

- Central County ITS Installations (FPI/CSMP #1-3)
- SR-4 EB Widening from I-680 to Willow Pass Road (East) (FPI/CSMP #7, 8, and 12)
- SR-4 WB Widening from Willow Pass Road (East) to I-680 (FPI/CSMP #6 and 9)

In addition to these mainline packages, stakeholders in Central County also helped to define a more explicit phasing and implementation scenario for future improvements to the I-680/SR-4 interchange. A related package of improvements was identified to build on the refined I-680/SR-4 interchange improvements. Collectively referred to as Scenario 5, this package would adjust ramp configurations and add eastbound lanes between the northbound I-680 on-ramp and San Marco Boulevard on-ramp.⁴ Finally, the study team also identified key transit projects in Martinez and Pittsburg/Bay Point and multiple improvements on adjacent arterials. Figures 2, 3, 4, and 5 show the Short-Term and Long-Term projects for Central County.

East County

For the purposes of this study, projects that are already well underway and expected to be completed prior to 2015 are included in the baseline conditions. These include the following:

- the 8-lane widening of SR-4 east, from Loveridge Road to SR-160
- e-BART from the West Pittsburg/Bay Point Station to Hillcrest Avenue, and
- the widening from 2-to-4 lanes of the SR-4 Bypass from Lone Tree Way to Balfour Road (Segment 2).

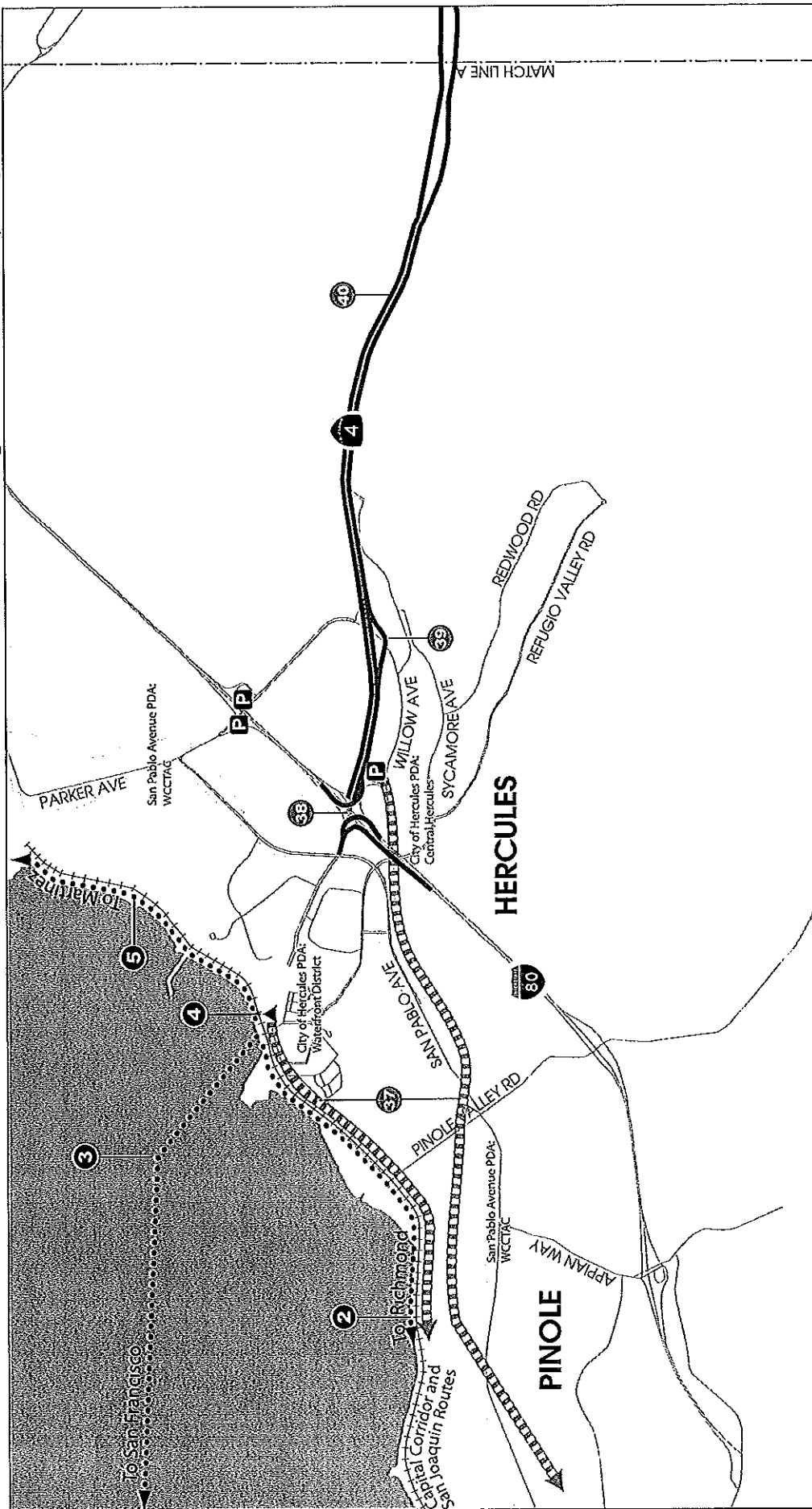
Three sets of projects for East County are items that were carried forward directly from the CSMP:

- East County ITS Installations (FPI/CSMP #1-3)
- East County Ramp Metering (FPI/CSMP #4-7)
- SR-4 Ramp Metering (FPI/CSMP #13-14)

In addition to these traffic management projects on SR-4, East County stakeholders helped to identify numerous projects on parallel arterials, including the Kirker Pass Truck Climbing Lane, improvements to arterial signals and intersections, widening of several key parallel arterials, and additional construction phases of the SR-4 Bypass. Figures 4, 5, 6, and 7 show the Short-Term and Long-Term projects for East County.

⁴ See Chapter 5 for a detailed description of Scenario 5.

Figure 1 - West County Project Strategies



Short-Term:

- <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
- Increased Richmond-Hercules service along the existing Capitol Corridor rail line.
- Hercules Ferry Service from Hercules to San Francisco.
- Hercules Intermodal Transit Station construction to serve the Capital Corridor and future Ferry Service.
- Increased Hercules-Martinez service along the existing Capitol Corridor rail line.

Long-Term:

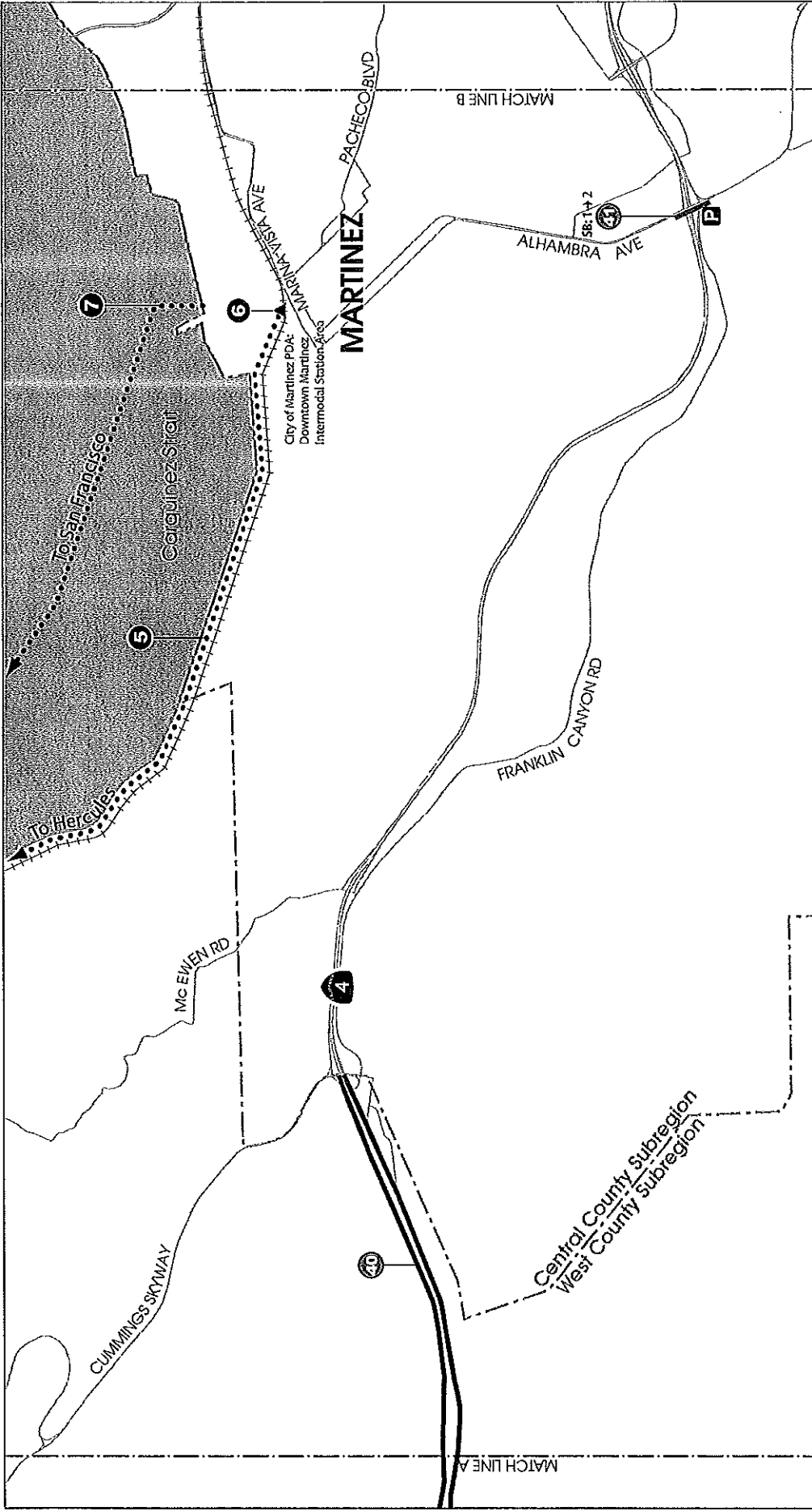
- <Not illustrated> SR-4 EB and WB Ramp Metering between I-80 and I-680 (FPI/CSMP #13-14).
- wBART - Operate rail services from Hercules to the Richmond BART station. (Exact alignment TBD).
- Ultimate I-80/SR-4 Interchange Improvements - Widen I-80 WB on-ramp from 1 to 3 lanes at John Muir Parkway and construct flyover connector ramps from NB I-80 to WB SR-4 and from SB I-80 to EB SR-4.
- Willow Ave Ramp Replacement - reconstruct the WB ramps as diagonal ramps.
- State Route 4 West, Phase 2 - Upgrade SR-4 from an expressway to a freeway between I-80 and Cummings Skyway.

Legend:

- Existing Roadway
- Existing Passenger Rail
- Existing Park & Ride Facility
- Priority Development Area (PDA)
- Roadway Improvement (Short-Term)
- Roadway Improvement (Long-Term)
- Transit Improvement (Short-Term)
- Transit Improvement (Long-Term)
- Intersection/Interchange Improvement (Short-Term)
- Intersection/Interchange Improvement (Long-Term)
- Transit Improvement (Station)

North Arrow

4-14
Figure 2 - West and Central County Project Strategies



- Short-Term:**
- <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
 - Increased Hercules-Martinez service along the existing Capitol Corridor rail line.
 - Martinez Intermodal Station (Phase 3) - 425 parking spaces, vehicles, and pedestrian bridges.
 - Martinez Ferry Service between Martinez and San Francisco.
- Long-Term:**
- <Not illustrated> SR-4 EB and WB Ramp Metering between I-80 and I-680 (FPI/CSMP #13-14).
 - State Route 4 West, Phase 2 - Upgrade SR-4 from an expressway to a freeway between I-80 and Cummings Skyway.
 - Alhambra Ave Safety Improvements: Construct a 2nd SB lane from Walnut Ave to Franklin Canyon Rd.
- Legend:**
- Existing Roadway
 - Existing Passenger Rail
 - Existing Park & Ride Facility
 - Priority Development Area (PDA)
 - Roadway Improvement (Short-Term)
 - Roadway Improvement (Long-Term)
 - Transit Improvement (Short-Term)
 - Transit Improvement (Long-Term)
 - Intersection/Interchange Improvement (Short-Term)
 - Intersection/Interchange Improvement (Long-Term)
 - Transit Improvement (Station)

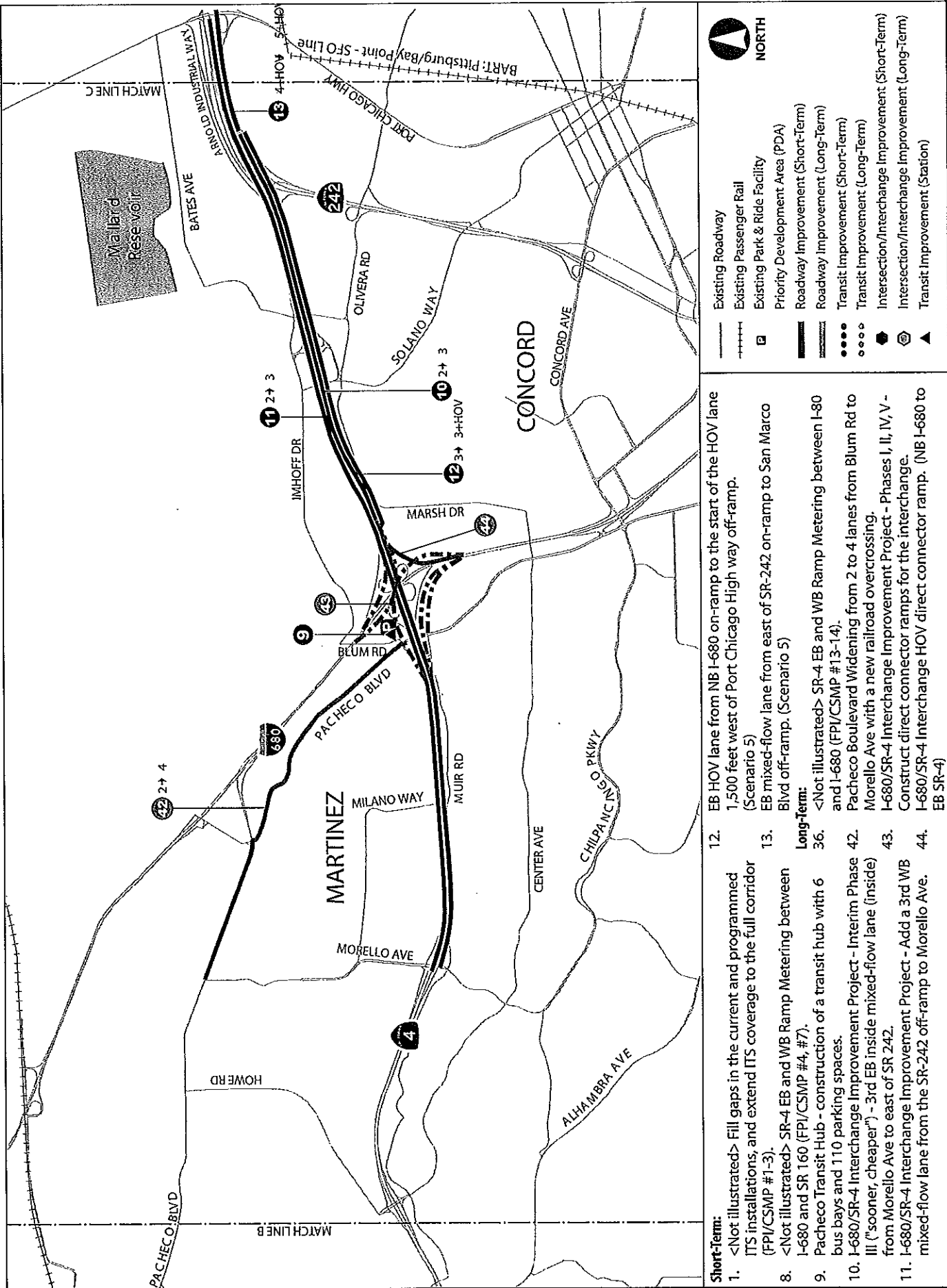
Short-Term:

- <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
- Increased Hercules-Martinez service along the existing Capitol Corridor rail line.
- Martinez Intermodal Station (Phase 3) - 425 parking spaces, vehicles, and pedestrian bridges.
- Martinez Ferry Service between Martinez and San Francisco.

Long-Term:

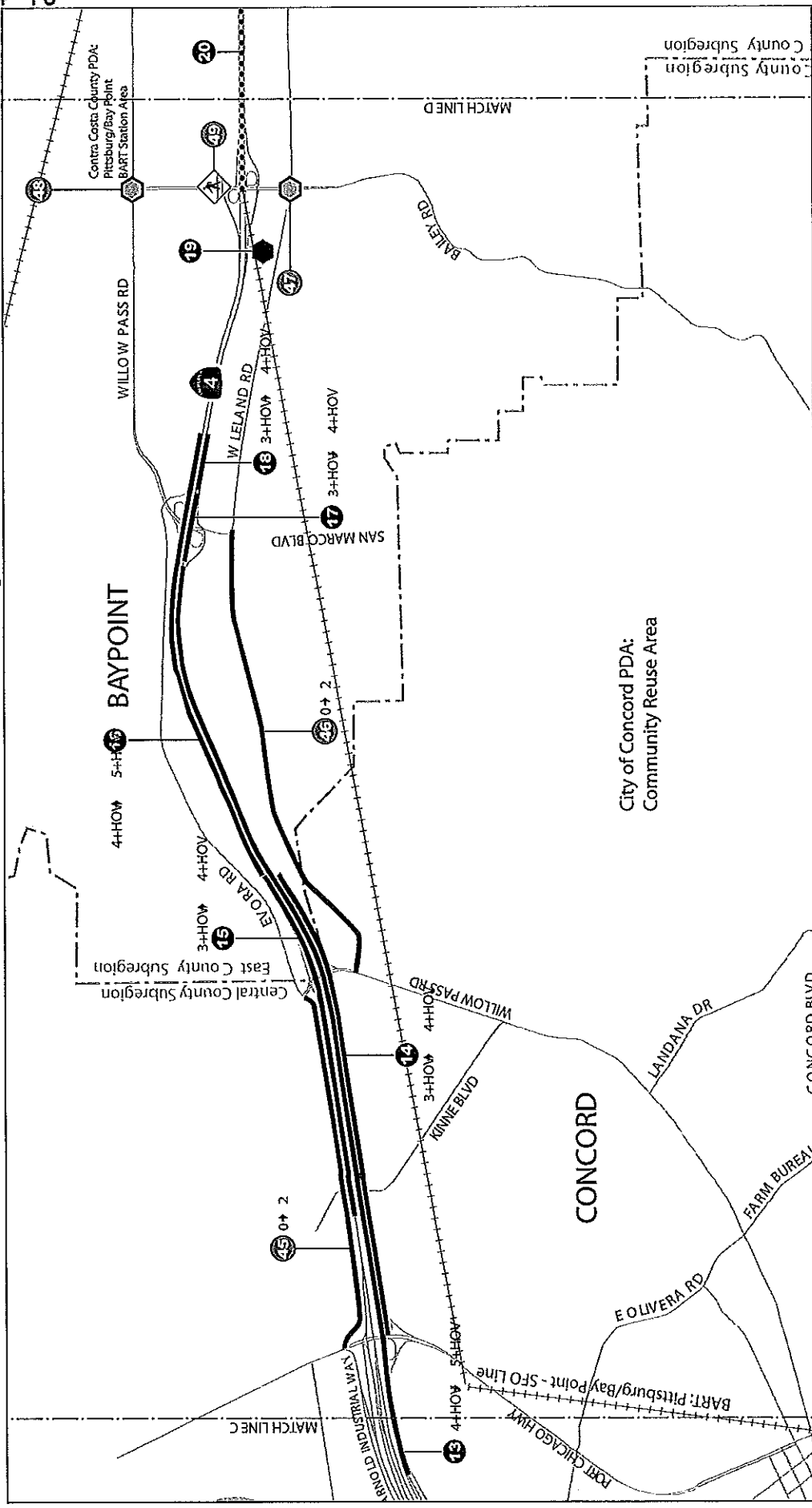
- <Not illustrated> SR-4 EB and WB Ramp Metering between I-80 and I-680 (FPI/CSMP #13-14).
- State Route 4 West, Phase 2 - Upgrade SR-4 from an expressway to a freeway between I-80 and Cummings Skyway.
- Alhambra Ave Safety Improvements: Construct a 2nd SB lane from Walnut Ave to Franklin Canyon Rd.

Figure 3 - Central County Project Strategies



- Short-Term:**
1. <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
 8. <Not illustrated> SR-4 EB and WB Ramp Metering between I-680 and SR 160 (FPI/CSMP #4, #7).
 9. Pacheco Transit Hub - construction of a transit hub with 6 bus bays and 110 parking spaces.
 10. I-680/SR-4 Interchange Improvement Project - Interim Phase III ("sooner, cheaper") - 3rd EB inside mixed-flow lane (inside from Morello Ave to east of SR 242).
 11. I-680/SR-4 Interchange Improvement Project - Add a 3rd WB mixed-flow lane from the SR-242 off-ramp to Morello Ave.
- Long-Term:**
12. EB HOV lane from NB I-680 on-ramp to the start of the HOV lane 1,500 feet west of Port Chicago High way off-ramp. (Scenario 5)
 13. EB mixed-flow lane from east of SR-242 on-ramp to San Marco Blvd off-ramp. (Scenario 5)
 36. <Not illustrated> SR-4 EB and WB Ramp Metering between I-80 and I-680 (FPI/CSMP #13-14).
 42. Pacheco Boulevard Widening from 2 to 4 lanes from Blum Rd to Morello Ave with a new railroad overcrossing.
 43. I-680/SR-4 Interchange Improvement Project - Phases I, II, IV, V - Construct direct connector ramps for the interchange.
 44. I-680/SR-4 Interchange HOV direct connector ramp. (NB I-680 to EB SR-4)
- Legend:**
- Existing Roadway
 - Existing Passenger Rail
 - Existing Park & Ride Facility
 - Priority Development Area (PDA)
 - Roadway Improvement (Short-Term)
 - Roadway Improvement (Long-Term)
 - Transit Improvement (Short-Term)
 - Transit Improvement (Long-Term)
 - Intersection/Interchange Improvement (Short-Term)
 - Intersection/Interchange Improvement (Long-Term)
 - Transit Improvement (Station)

4-16
Figure 4 - Central and East County Project Strategies



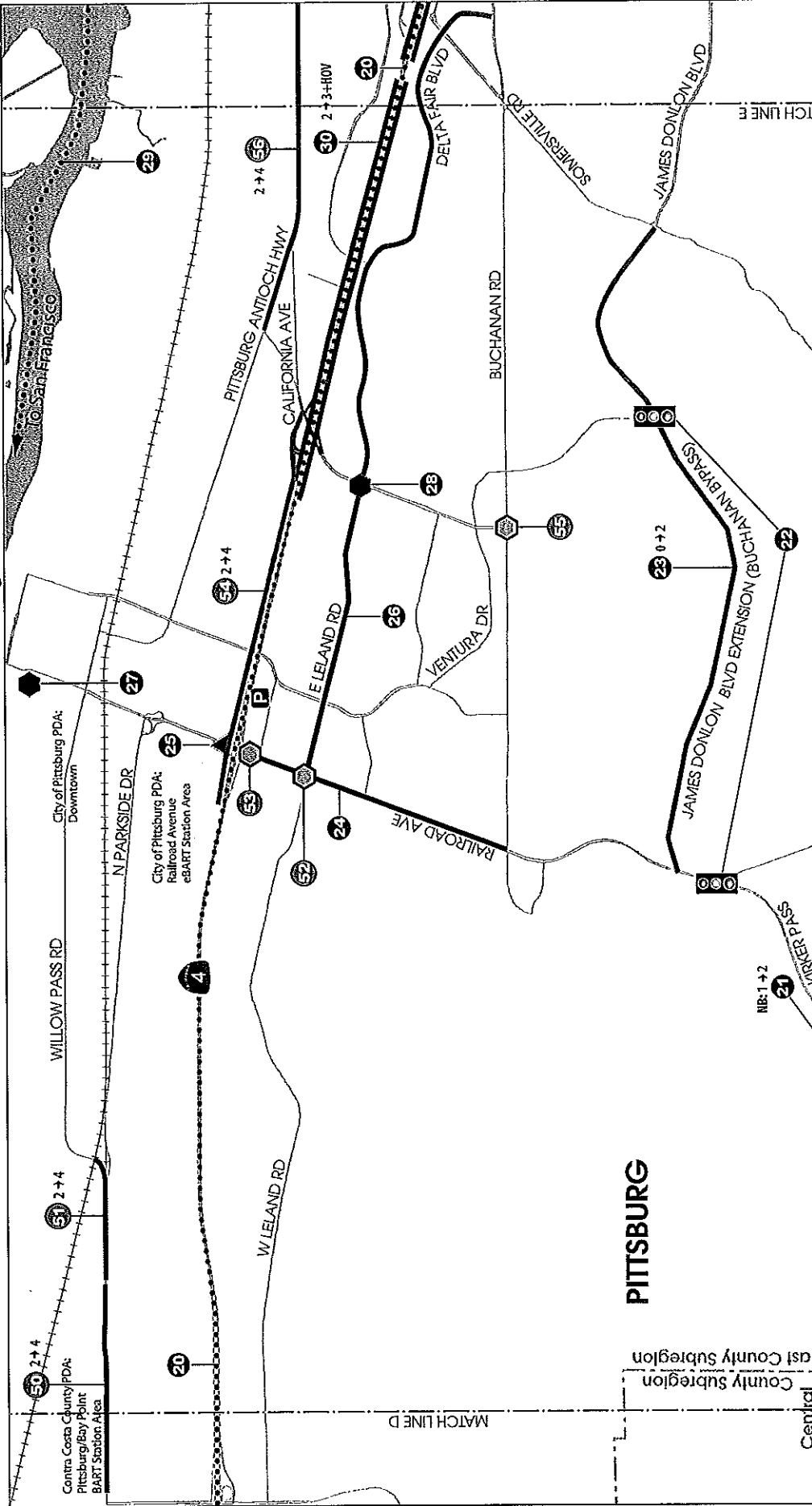
Legend

- Existing Roadway
- Existing Passenger Rail
- Existing Park & Ride Facility
- Priority Development Area (PDA)
- Roadway Improvement (Short-Term)
- Roadway Improvement (Long-Term)
- Transit Improvement (Short-Term)
- Transit Improvement (Long-Term)
- Intersection/Interchange Improvement (Short-Term)
- Intersection/Interchange Improvement (Long-Term)
- Transit Improvement (Station)

North Arrow

- Short-Term:**
1. <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
 8. <Not illustrated> SR-4 EB and WB Ramp Metering between I-680 and SR 160 (FPI/CSMP #4, #7).
 13. EB mixed-flow lane from east of SR-242 on-ramp to San Marco Blvd off-ramp. (Scenario 5)
 14. Extend the EB mixed flow lane from the lane drop at Port Chicago Hwy to Willow Pass Rd (West) on-ramp (FPI/CSMP #8).
 15. Extend the WB mixed-flow lane from its start east of Port Chicago Hwy to Willow Pass Rd (West) off-ramp (FPI/CSMP #6).
 16. Extend the existing WB mixed-flow lane from the lane drop east of Willow Pass Rd (East) off-ramp to the Willow Pass Rd (West) off-ramp (FPI/CSMP #9).
 17. EB mixed-flow lane from San Marco Blvd off-ramp to San Marco Blvd on-ramp. (Scenario 5)
- Long-Term:**
18. Extend the existing EB mixed-flow lane from Willow Pass Rd (East) to the lane located east of Willow Pass Rd (East) (FPI/CSMP #12).
 19. Pittsburg/Bay Point BART Station Area - Expanded parking.
 20. East Contra Costa BART Extension (eBART) from the Pittsburg/Bay Point BART Station to Hillcrest Ave.
 45. Parallel Arterial Improvements - Extend Evora Rd from Willow Pass Rd to Port Chicago Hwy.
 46. Parallel Arterial Improvements - Extend West Leland Rd to Willow Pass Rd.
 47. Bailey Rd/Leland Rd Intersection Improvements.
 48. Bailey Rd/Willow Pass Rd Intersection Improvements.
 49. Bailey Rd Pedestrian Interchange Improvements and Design Modifications.

Figure 5 - Central and East County Project Strategies



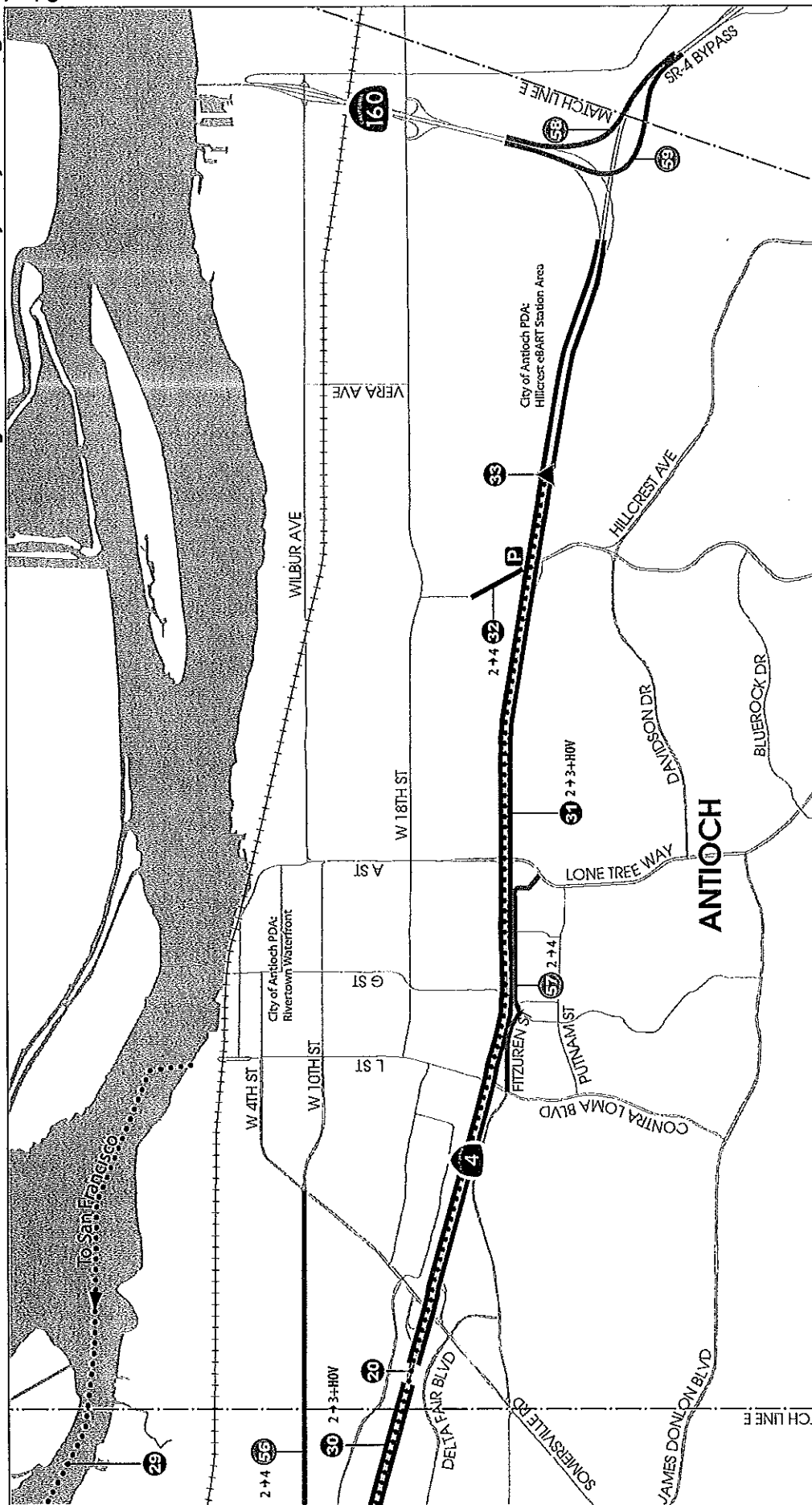
- Short-Term:**
- <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
 - <Not illustrated> SR-4 EB and WB Ramp Metering between I-680 and SR 160 (FPI/CSMP #4, #7).
 - East Contra Costa BART Extension (eBART) from the Pittsburg/Bay Point BART Station to Hillcrest Ave.
 - Kirker Pass Rd Truck Climbing Lane from Clearbrook Drive to 1000' east of E Hess Rd (NB), (Central County project)
 - Control Point Metering at Kirker Pass Rd/Nortonville Rd and James Donlon Blvd/Ventura Rd.
 - James Donlon Blvd Extension between Somersville Rd and Kirker Pass Rd. Construct new two-lane roadway, 2.2 miles in length with a 60 mph design speed.
 - Arterial Signalization Improvements on Railroad Ave.
 - Railroad Ave eBART Station construction, Station area improvements, and transit access improvements.
- Long-Term:**
- Willow Pass Rd Widening from Bailey Rd to Pittsburg City Limits.
 - Willow Pass Rd Widening from Range Rd to Loftus Rd.
 - Railroad Ave/Leland Rd Intersection Improvements.
 - Railroad Ave/EB SR-4 Ramps Intersection Improvements.
 - California Ave Widening from Railroad Ave to Loveridge Rd.
 - Buchanan Rd/Loveridge Rd Intersection Improvements.
 - Pittsburg-Antioch Hwy Widening from 2 to 4 lanes between Somersville and Loveridge Rd.

- Communication equipment for signal synchronization on E Leland Rd and Delta Fair Blvd.
- Downtown Pittsburg connections to future eBART Railroad Ave Station.
- Loveridge Rd/Leland Rd Intersection Improvements.
- Antioch Ferry Service to San Francisco.
- SR-4 East Widening from 2 lanes to 3 lanes + 1 HOV lane in each direction between Loveridge Rd and Somersville Rd.

- Existing Roadway**
- Existing Passenger Rail**
- Existing Park & Ride Facility**
- Priority Development Area (PDA)**
- Roadway Improvement (Short-Term)**
- Roadway Improvement (Long-Term)**
- Transit Improvement (Short-Term)**
- Transit Improvement (Long-Term)**
- Intersection/Interchange Improvement (Short-Term)**
- Intersection/Interchange Improvement (Long-Term)**
- Transit Improvement (Station)**



4-18
Figure 6 - East County Project Strategies



Short-Term:

- 1. <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
- 8. <Not illustrated> SR-4 EB and WB Ramp Metering between I-680 and SR 160 (FPI/CSMP #4, #7).
- 20. East Contra Costa BART Extension (eBART) from the Pittsburg/Bay Point BART Station to Hillcrest Ave.
- 29. Antioch Ferry Service to San Francisco.
- 30. SR-4 East Widening from 2 lanes to 3 lanes + 1 HOV lane in each direction between Loveridge Rd and Somersville Rd.
- 31. SR-4 East Widening from 2 lanes to 3 lanes + 1 HOV lane in each direction between Somersville Rd and SR 160.

Long-Term:

- 56. Pittsburg-Antioch Hwy Widening from 2 to 4 lanes between Somersville and Loveridge Rd.
- 57. West Tregallas Rd/Fitzuen Rd Widening from 2 to 4 lanes.
- 58. SR-4 Bypass/SR-160 Northbound Connector.
- 59. SR-4 Bypass/SR-160 Southbound Connector.

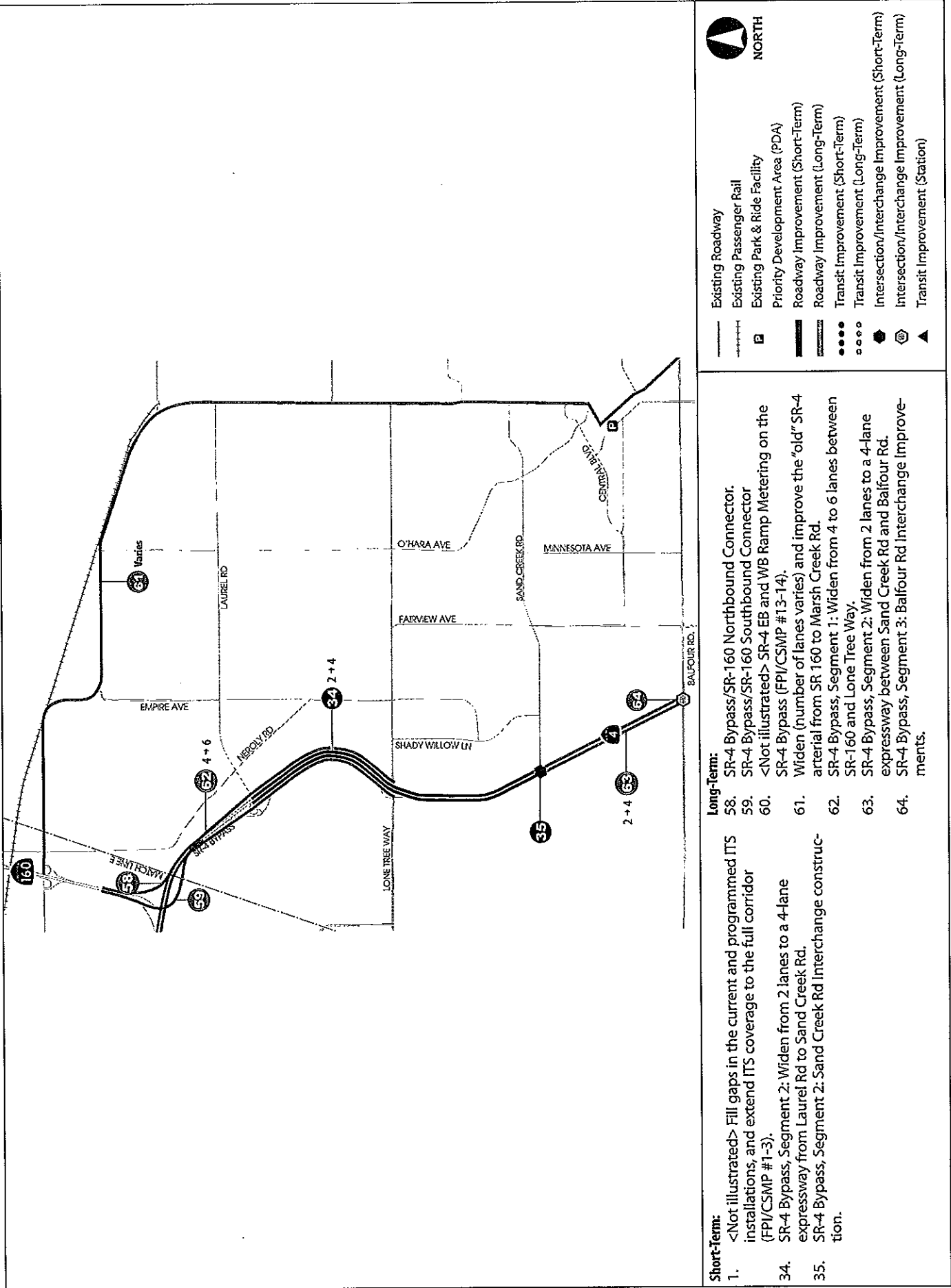
Legend:

- Existing Roadway
- Existing Passenger Rail
- Existing Park & Ride Facility
- Priority Development Area (PDA)
- Roadway Improvement (Short-Term)
- Roadway Improvement (Long-Term)
- Transit Improvement (Short-Term)
- Transit Improvement (Long-Term)
- Intersection/Interchange Improvement (Short-Term)
- Intersection/Interchange Improvement (Long-Term)
- Transit Improvement (Station)

North

- 32. Widen Hillcrest Ave from 2 to 4 lanes between SR-4 and 18th St.
- 33. Antioch eBART Station construction and restructuring of Route 300 express service.

Figure 7 - East County Project Strategies



- Short-Term:**
- <Not illustrated> Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).
 - SR-4 Bypass, Segment 2: Widen from 2 lanes to a 4-lane expressway from Laurel Rd to Sand Creek Rd.
 - SR-4 Bypass, Segment 2: Sand Creek Rd Interchange construction.
- Long-Term:**
- SR-4 Bypass/SR-160 Northbound Connector.
 - SR-4 Bypass/SR-160 Southbound Connector
 - <Not illustrated> SR-4 EB and WB Ramp Metering on the SR-4 Bypass (FPI/CSMP #13-14).
 - Widen (number of lanes varies) and improve the "old" SR-4 arterial from SR 160 to Marsh Creek Rd.
 - SR-4 Bypass, Segment 1: Widen from 4 to 6 lanes between SR-160 and Lone Tree Way.
 - SR-4 Bypass, Segment 2: Widen from 2 lanes to a 4-lane expressway between Sand Creek Rd and Balfour Rd.
 - SR-4 Bypass, Segment 3: Balfour Rd Interchange Improvements.
- Legend:**
- Existing Roadway
 - Existing Passenger Rail
 - Existing Park & Ride Facility
 - Priority Development Area (PDA)
 - Roadway Improvement (Short-Term)
 - Roadway Improvement (Long-Term)
 - Transit Improvement (Short-Term)
 - Transit Improvement (Long-Term)
 - Intersection/Interchange Improvement (Short-Term)
 - Intersection/Interchange Improvement (Long-Term)
 - Transit Improvement (Station)
- North Arrow**

Section 2: Performance Assessment Measures

One of the key themes that emerged from the CSMP was the need to evaluate potential improvements in the SR-4 corridor using a broad set of performance measures. There was a clear recognition that quantitative mobility metrics are not the only important decision-making criteria, and that some qualitative measures are also necessary in order to capture the multi-dimensional nature of stakeholders' policy considerations. Through meetings of the C-TAC and C-PAC, stakeholders provided feedback on the proposed evaluation criteria, leading to a final list of fourteen metrics. This chapter provides definitions for each of the criteria and a discussion of the relevant analytical methods used for each item. Performance results, by metric, for each planning area are described in the next chapter.

Quantitative Measures

The quantitative metrics primarily focus on mobility improvements within the corridor and the relative cost of achieving those improvements, also referred to as cost-effectiveness. The mobility metrics described below are computed based on output from *FREQ* – a traffic operations model that combines forecast traffic volumes and vehicle occupancy⁵ together with roadway geometries to analyze future performance of the mainline facility in real time.

To provide appropriate evaluation of the Short-Term and Long-Term groups of projects, quantitative results were generated for 2015 and 2030, respectively. The current planned and funded improvements in the corridor are included in the default scenario for 2015 and 2030, which is used to produce the baseline performance results for each of the three mobility metrics: average speed, average travel time, and annual person hours of delay.⁶ Each proposed strategy or package is separately tested in *FREQ*, and the new results are compared to the baseline in order to determine the change in performance that is attributable to each of the projects. The baseline results used for this study are presented below in Table 2.

Table 2 - Future Baseline Conditions

	2015		2030	
	<i>Average Speed (mph)</i>	<i>Average Travel Time (min)</i>	<i>Average Speed (mph)</i>	<i>Average Travel Time (min)</i>
West	50	5	44	6
Central	38	32	31	66
East	53	28	41	55

Average Speed (mph) and Average Travel Time (min)

Average speed is computed by averaging the travel speed during the peak hour from each roadway segment within the county sub area (West, Central, or East). Average travel time is derived by combining the average speed in each planning area and the length of SR-4 located within that planning area. Both figures are composite values for all vehicles on the facility, in both mainline lanes and HOV lanes.

⁵ Future traffic volumes and vehicle occupancy for 2015 and 2030 were obtained from the CCTA travel demand model.

⁶ Annual person hours of delay were calculated for the SR-4 corridor (3,477,138 in the Short-Term) and (13,594,035 in the Long-Term).

Annual Reductions in Total Delay

Total person hours of delay is comprised of both recurrent and non-recurrent delay. Recurrent delay represents the difference between typical projected travel speeds along the corridor and free-flow speeds (70 mph). Non-recurrent delay represents the additional delay incurred due to accidents, incidents, and other unusual conditions which periodically interfere with normal operations of the facility. Delay from both sources is summed across all vehicles over the entire day and then annualized, using occupancy factors to convert vehicle-hours of delay to person-hours of delay. The reduction in annual delay that is attributable to each strategy or package is expressed in hours, and is comparable to the baseline hours of delay.

Project Cost and Cost Effectiveness

As described previously, each project, strategy, or package was assigned a cost estimate, either based directly on published documentation about the proposed improvements or based on study team review. Details about the cost estimates for each project are provided in Appendix B. The evaluation matrix lists the total cost for each project in 2011 dollars. In addition, a cost-effectiveness metric is computed by dividing the total cost by the reduction in hours of delay. The cost-effectiveness metric helps compare different sized projects, because different types of improvements may have disproportionate levels of benefit to the corridor.

The cost-effectiveness analysis expresses benefits (savings in delay) in a format (\$/hour) that can be easily related to a user's perception of their value-of-time which is ephemeral and typically varies by trip purpose. Typically, value-of-time ranges from \$5 to \$50 where the lower end of the spectrum represents trips similar to recreational trips and the higher value represents trips similar to commercial vehicle trips. In general, the average value of-time for travel in the Bay area is between \$14 and \$15. Improvement strategies with an estimated rating of \$15 or less per hour of delay saved can be thought of as cost-effective in that the cost to construct and maintain the strategy is offset by user cost benefits.

Qualitative Measures

Based on consultation with the C-TAC, a list of qualitative measures was developed to capture whether each project has potential benefits that cannot be derived from standard outputs of transportation models. Most of the qualitative measures represent specific aspects of local and regional policy goals, such as improving access or reducing emissions. The evaluation process involved rating each strategy or package on whether it would be "more favorable", "favorable", or "less favorable" to achieving the particular goal.

System Continuity

The goal of system continuity is to achieve a network of roadway, transit, bicycle, pedestrian, and goods movement facilities that is well connected throughout the corridor, allowing for efficient movements by users within each mode and effective connections between modes.

Improve Multimodal Access, Mobility, and Reliability

This category of improvements specifically focuses on calling out mode-specific benefits of particular projects by highlighting benefits in each the following areas:

- Freeway operational improvements
- Transit service enhancements/improvements
- Transit speed improvements
- Efficiency improvements through use of signal timing and ramp metering
- Increases in walking and biking (mode share for public transit and non-motorized modes)

Sustainable Community Strategy (SCS) and Community Goals

As described in the Introduction, two major pieces of state legislation (AB 32 and SB 375) require that MTC and ABAG collaborate to develop an integrated land-use and transportation plan known as SCS, and incorporate it into the Regional Transportation Plan. These regional agencies have recognized that reducing VMT is going to be a necessary and critical component of any plan that is capable of successfully meeting the GHG-reduction targets set in AB 32. As a result, there is increased regional attention on VMT, emissions, and jobs-housing balance, and this study seeks to make a preliminary evaluation of how well the candidate projects can serve these regional goals:

- Better access to jobs and housing
- Reduced Vehicle Miles Traveled (VMT)
- Reduced per-capita CO2 emissions
- Reduced particulate emissions

This Page Intentionally Left Blank

Section 3: Corridor Performance Results

This section describes highlights of the corridor performance assessment conducted using the metrics discussed above. The discussion is organized by planning area and divided into Short-Term (2015-2020) and Long-Term (2020-2030) in each planning area. Detailed evaluation matrices are provided in Appendix B.

A few general observations can be made about the results across the entire corridor. First, given its low cost and ability to mitigate non-recurrent delay, ITS projects perform well in all planning areas. Ramp metering also provides cost-effective benefits to both quantitative and qualitative performance.

West County Performance Assessment

Given the relatively low levels of traffic congestion on the west segment of SR-4, projects in this planning area generally do not result in significant changes to baseline performance. Average speed and average travel time for all projects and packages are the same as for future baseline levels. Most projects in West County result in relatively small reductions in delay, but again, this is attributable to the current lack of congestion and delay on this segment of SR-4.

Short-Term 2015 – 2020

All Short-Term projects in West County produce modest reductions in total delay, typically less than 5,000 hours per year, or less than 0.2% of 2015 baseline levels in the SR-4 corridor. All three packages are rated as “more favorable” to at least one of the multi-modal criteria, as shown in Table 3.

Long-Term 2020 – 2030

The Long-Term projects in West County result in somewhat higher absolute levels of delay reduction, but the total level of delay in the SR-4 corridor also increases in the Long-Term, so that most projects still result in less than 1% fewer hours of delay than the 2030 baseline. The one exception is West County Ramp Metering (ID #36), which provides 615,082 hours of delay reduction, an improvement of 4.5% for the corridor. This strategy is also among the most cost-effective projects in the entire corridor, requiring only \$0.30 per person-hour of delay saved. As in the Short-Term group, all projects are “more favorable” to at least one of the multi-modal criteria. In addition, two projects are “more favorable” for all of the SCS metrics: West County Ramp Metering (ID#36) and Willow Ave Ramp Replacement (ID#39), as shown in Table 4.

Many of the transit-related projects in West County do not have a strong impact on performance in the SR-4 corridor. This is largely because the transit network is primarily oriented north-south along the I-80 corridor rather than serving the east-west movements that parallel the SR-4 freeway. To ensure the West County performance assessment results are not interpreted as an indication that transit projects are not important or beneficial for the West County planning area, project rankings for transit project along I-80 are not presented. More details on the West County performance assessment is provided in Appendix B.

Central County Performance Assessment

Results in Central County are highly varied across the different projects and packages, with some items standing out as the best performers in the entire corridor, and others producing only minor changes to baseline conditions.

Short-Term 2015 – 2020

The quantitative results for the Short-Term projects range from a 0.1% reduction to an 83% reduction in annual hours of delay. The latter package is the SR-4 Widening from I-680 to Willow Pass Road (East), and is composed of 10 projects in total (ID#8 and 10-18). This package raises the average speed in the Central County portion of SR-4 from 38 m.p.h. to 59 m.p.h., which is nearly the same as free-flow speeds. In addition, the package reduces average travel time by 50%. This package also performs extremely well on the qualitative analysis, being rated as "more favorable" to all criteria except for "increase walking and biking" which is rated as "less favorable". This package is ranked number 1, see Table 5. The other three Short-Term packages have mixed qualitative results, scoring "more favorable" on at least one of the multi-modal criteria and "favorable" on one or more of the SCS criteria, as shown in Table 5.

Long-Term 2020 – 2030

In the Long-Term group, quantitative results are equally varied, but slightly lower in magnitude. Three sets of projects are related to improving arterial facilities near SR-4. The Parallel Arterial Improvements on Evora Road (ID#45) and West Leland Road (ID#46) together result in nearly 1 million hours of delay reduction, or a savings of nearly 7% for the corridor as a whole compared to the 2030 baseline. The other two arterial projects are Alhambra Ave Safety Improvements (ID#41) and Pacheco Boulevard Widening (ID#42). Neither project results in delay reductions on the SR-4 mainline and they also have relatively low qualitative results, rating as "less favorable" in nearly all categories, as shown in Table 6.

The package of improvements for the I-680/SR-4 Interchange (ID#43 & 44) has strong results on both quantitative and qualitative metrics and is ranked as number 1. Together they improve average speed from the 2030 baseline of 31 m.p.h. to 44 m.p.h., reduce delay by 1,980,000 hours per year, and reduce average travel time by 25%. This package is also rated as "most favorable" on all criteria except signal timing/ramp metering and walking/biking, as shown in Table 6.

More details on Central County projects performance assessment are provided in Appendix B.

Table 3 - Short-Term West County Projects

		Performance Measures on SR-4										Quantitative Measures		
		Qualitative Measures					SCS					Mobility Improvements		
		Multi-Modal Access, Mobility, and Reliability		Reduce VMT			Better Access to Jobs and Housing		Increase Walking and Biking		Annual Reductions in Total Delay (Recurrent and Non-Recurrent - hr)		Cost Effectiveness	
Year	ID	Project	System Continuity	Freeway Operational Improvement	Enhance Transit Service	Improve Transit Speed	Improve Efficiency Through Signal Timing and Ramp Metering	Reduce per-capita CO ₂ Emissions	Reduce Particulate Emissions	Increase Walking and Biking	Annual Reductions in Total Delay (Recurrent and Non-Recurrent - hr)	Cost Effectiveness		
	1	West County ITS installations: Fill gaps in the current and programmed, and extend ITS coverage to the full corridor (FP/CSMP #1-3).	●	●	○	○	●	○	○	○	1,345*	\$1.25 per person-hour of delay saved		
	2	Capitol Corridor Service: Increased Richmond-Hercules service along the existing Capitol Corridor rail line.	●	○	●	○	○	○	○	○	1,741	\$1,670 per person-hour of delay saved		
	5	Increased Hercules-Martinez service along the existing Capitol Corridor rail line.	●	○	●	○	○	○	○	○	4,351	\$645 per person-hour of delay saved		
	3	Hercules Ferry Service and Intermodal Station: Hercules Ferry Service from Hercules to San Francisco.	●	○	●	○	○	○	○	○				
	4	Hercules Intermodal Transit Station construction to serve the Capital Corridor and future Ferry Service.	●	○	●	○	○	○	○	○				

Projects may be rearranged in the future as project development occurs and funding plans are identified.

Subject to review by the RTPCs.

LEGEND:

Qualitative:

● More Favorable ○ Favorable ○ Less Favorable

* Note: Non-recurrent

This Page Intentionally Left Blank

CORRIDOR PERFORMANCE RESULTS

Table 4 - Long-Term West County Projects

Year ID		Performance Measures on SR-4										Quantitative Measures	
		Qualitative Measures					SCS					Mobility Improvements	
		Multi-Modal Access, Mobility, and Reliability		Reduce VMT			Reduce CO ₂ Emissions		Reduce PM ₁₀ Emissions		Increase Walking and Biking	Annual Reductions in Total Delay (Recurrent and Non-Recurrent-hr)	Cost Effectiveness
Project		System Continuity	Freeway Operational Improvement	Enhance Transit Service	Improve Transit Speed	Improve Efficiency Through Signal Timing and Ramp Metering	Better Access to Jobs and Housing	Reduce per-capita CO ₂ Emissions	Reduce PM ₁₀ Emissions	Increase Walking and Biking	Annual Reductions in Total Delay (Recurrent and Non-Recurrent-hr)	Cost Effectiveness	
36	West County Ramp Metering: SR-4 EB and WB Ramp Metering between I-80 and I-680 (FPI/CSP #13-14).	●	●	○	○	●	●	●	●	○	Base: 13,594,003 615,082	\$0.3 per person-hour of delay saved	
37	wBART: Operate rail services from Hercules to the Richmond BART station.	●	○	●	○	○	●	○	○	○	1,899	\$21,333 per person-hour of delay saved	
38	Ultimate I-80/SR-4 Interchange Improvements: Widen I-80 WB on-ramp from 1 to 3 lanes at John Muir Parkway and construct flyover connector ramps from NB I-80 to WB SR-4 and from SB I-80 to EB SR-4.	●	●	○	○	○	●	●	●	○	18,996	\$1,010 per person-hour of delay saved	
39	Willow Ave Ramp Replacement: Reconstruct the WB ramps as diagonal ramps.	●	●	○	○	○	●	●	●	○	95,633	\$116 per person-hour of delay saved	
40	State Route 4 West. Construct to full Freeway Standards: Upgrade SR-4 from an expressway to a freeway between I-80 and Cummings Skyway.	●	●	○	○	○	●	●	●	○	13,594	\$554 per person-hour of delay saved	

Projects may be rearranged in the future as project development occurs and funding plans are identified. Subject to review by the RTPCs.

LEGEND:

Qualitative:

- "More Favorable"
- "Less Favorable"
- * Note: Non-recurrent

This Page Intentionally Left Blank

Table 5 - Short-Term Central County Projects

Year	ID	Project	Qualitative Measures						Quantitative Measures				Rank	
			Multi-Modal Access, Mobility, and Reliability			SCS			Mobility Improvements					
			Freeway Operational Improvement	Enhance Transit Service	Improve Transit Speed	Improve Efficiency Through Signal Timing and Ramp Metering	Better Access to Jobs and Housing	Reduce per-capita CO ₂ Emissions	Reduce VMT	Reduce Particulate Emissions	Increase Walking and Biking	Annual Reductions in Total Delay (Recurrent and Non-Recurrent-hh)		Cost Effectiveness
	8	SR-4 EB Widening from I-680 to Willow Pass Rd (East) (FPI/CSMP #7).	●	○	○	○	○	○	○	○	○	○	○	
	18	Extend the existing EB mixed-flow lane from Willow Pass Rd (East) to the lane located east of Willow Pass Rd (East) (FPI/CSMP #12).	●	○	○	○	○	○	○	○	○	○	○	
	17	EB mixed-flow lane from San Marco Blvd off-ramp to San Marco Blvd on-ramp (Scenario 5).	●	○	○	○	○	○	○	○	○	○	○	
	14	Extend the EB mixed flow lane from the lane drop at Port Chicago Hwy to Willow Pass Rd (West) on-ramp (FPI/CSMP #6).	●	○	○	○	○	○	○	○	○	○	○	
	13	EB mixed-flow lane from east of SR-242 on-ramp to San Marco Blvd off-ramp (Scenario 5).	●	○	○	○	○	○	○	○	○	○	○	
	10	I-680/SR-4 Interchange Improvement Project - Phase III ("sooner, cheaper") - 3rd EB mixed-flow (inside) lane from Morello Ave to east of SR 242.	●	○	○	○	○	○	○	○	○	○	○	
	12	EB HOV lane from NB I-680 on-ramp to the start of the HOV lane 1,500 feet west of Port Chicago Highway off-ramp (Scenario 5).	●	○	○	○	○	○	○	○	○	○	○	
		SR-4 WB Widening from Willow Pass Rd (East) to I-680:												
	11	I-680/SR-4 Interchange Improvement Project - Phase III - 3rd WB mixed-flow (inside) lane from SR-242 off-ramp to Morello Ave.	●	○	○	○	○	○	○	○	○	○	○	
	15	Extend the existing WB mixed-flow lane from the Willow Pass Rd (West) off-ramp to the lane-odd east of Port Chicago Hwy off-ramp (FPI/CSMP #6).	●	○	○	○	○	○	○	○	○	○	○	
	16	Extend the existing WB mixed-flow lane from the lane drop east of Willow Pass Rd (East) off-ramp to Willow Pass Rd (West) off-ramp (FPI/CSMP #3).	●	○	○	○	○	○	○	○	○	○	○	
	1	Central County ITS installations: Fill gaps in the current and programmed, and extend ITS coverage to the full corridor (FPI/CSMP #1-3).	●	○	○	○	○	○	○	○	○	○	○	\$2.3 per person-hour of delay saved
	2	Central County ITS installations: Martinez Ferry Service and Intermodal Station:	●	○	○	○	○	○	○	○	○	○	○	\$0.6 per person-hour of delay saved
	6	Martinez Intermodal Station (Phase 3) - 425 parking spaces, vehicles, and pedestrian bridges.	○	○	○	○	○	○	○	○	○	○	○	\$555 per person-hour of delay saved
	7	Ferry service between Martinez and San Francisco.	○	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved
		Krker Pass Rd Truck Climbing Lane:												
	21	From Clearbrook Drive to 1000 east of E Hesse Rd (NB).	○	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved

Projects may be re-ranked in the future as project development occurs and funding plans are identified.

Subject to review by the RTPCs.

LEGEND:

Qualitative:
 ● "More Favorable" ○ "Less Favorable"
 * Note: Non-occurrent

This Page Intentionally Left Blank

Table 6 - Long-Term Central County Projects

Year	ID	Project	Qualitative Measures						Quantitative Measures			Rank			
			Performance Measures on SR-4						Mobility Improvements						
2020 - 2030			Multi-Modal Access, Mobility, and Reliability						SCS						
			System Continuity	Freeway Operational Improvement	Enhance Transit Service	Improve Transit Speed	Improve Efficiency Through Signal Timing and Ramp Metering	Easier Access to Jobs and Housing	Reduce per-capita CO ₂ Emissions	Reduce Particulate Emissions	Increase Walking and Biking		Annual Reductions in Total Delay (Recurrent and Non-Recurrent-hr)	Cost Effectiveness	
		I-680/SR-4 Interchange Improvements:													
	43	Project - Phases I, II, IV, V - Construct direct connector ramps for the interchange.	●	●	●	●	○	○	●	○	○	○	○	○	\$16.2 per person-hour of delay saved
	44	I-680/SR-4 Interchange HOV direct connector ramp.	●	●	●	●	○	○	○	○	○	○	○	○	\$16.2 per person-hour of delay saved
		Parallel Arterial Improvements:													
	45	Extend Elora Rd from Willow Pass Rd to Port Chicago Hwy.	●	●	○	○	○	○	○	○	○	○	○	○	\$8.92 per person-hour of delay saved
	46	Extend West Leiland Rd to Willow Pass Rd.	●	●	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved
		Pacheco Boulevard Widening:													
	42	Widen from 2 to 4 lanes from Blum Rd to Morello Ave with a new railroad overcrossing.	●	○	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved
		Alhambra Ave Safety Improvements:													
	41	Construct a 2nd SB lane from Walnut Ave to Franklin Canyon Rd.	●	○	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved

Projects may be reimagined in the future as project development occurs and funding plans are identified. Subject to review by the RTPCs.

LEGEND:
Qualitative:
 ● "More Favorable" ○ "Favorable" ○ "Less Favorable"
 *Note: Non-recurrent

This Page Intentionally Left Blank

East County Performance Assessment

Similar to West County, the future baseline conditions for East County do not have significant levels of traffic congestion. This is due primarily to the completion of major congestion-relieving projects in East County, including the SR-4 widening project and the eBART extension, both currently under construction.

Short-Term 2015 – 2020

As in the other planning areas, ITS Installations and Ramp Metering are some of best performing projects from a quantitative perspective. Similar to West County, the Ramp Metering strategy (ID#8) generates a higher level of delay reduction than ITS Installations (ID#1). However, the relative costs of the two projects lead to better cost-effectiveness for ITS than for Ramp Metering. Both projects rate very well on all of the auto-related qualitative metrics, as shown in Table 7.

The Control Point Metering (ID#22) is notable for the fact that it increases, rather than reduces, the total annual delay on SR-4; it is the only project which serves to lower average speeds on the mainline facility. Also, it is rated as "less favorable" on all qualitative criteria except System Continuity.

Finally, the package of projects for the SR-4 Bypass Widening (ID#34-35) scores very well on all SCS-related qualitative metrics. Unfortunately, it only produces modest reductions in delay, leading to poor performance on cost-effectiveness, as shown in Table 7.

The East County project performance assessment should be viewed as informing potential implementation trade-offs, rather than dictating a particular course of action in the years ahead. Therefore, project rankings are not presented. More details on the East County performance assessment is provided in Appendix B.

Long-Term 2020 – 2030

Some of the best performing projects in the Long-Term group relate to the package of East County Parallel Arterial Improvements (ID#50-51, 54, and 56-57). Together, these projects generate a delay reduction of 912,811 hours per year, a decrease of nearly 7% compared to 2030 baseline conditions. At \$4.67 per person-hour of delay saved, its cost-effectiveness is very good, and the package also rates well on all of the SCS-related qualitative metrics, as shown in Table 8.

There are three other Long-Term packages - East County Intersection Improvements (ID#52-53 and 55), SR-4 Bypass Ramp Metering (ID#60), and SR-4 Bypass (ID#58-59 and 61-64) - all of which have mixed performance results. Quantitative improvements in delay are modest, ranging from 0.2% reduction to 2.1% reduction in annual person-hours saved compared to the 2030 baseline improvements. In terms of qualitative criteria, most projects rate as "least favorable" on all of the auto-related metrics, see Table 8.

This Page Intentionally Left Blank

Table 7 - Short-Term East County Projects

Year	ID	Project	Performance Measures on SR-4										Quantitative Measures				
			Qualitative Measures					SCS					Mobility Improvements				
			System Continuity	Freeway Operational Improvement	Enhance Transit Service	Improve Transit Speed	Improve Efficiency Through Signal Timing and Ramp Metering	Better Access to Jobs and Housing	Reduce per-capita CO ₂ Emissions	Reduce VMT	Reduce Particulate Emissions	Increase Walking and Biking	Annual Reductions in Total Delay (Recurrent and Non-Recurrent-hh)	Cost Effectiveness			
	1	East County ITS installations: Fill gaps in the current and programmed ITS installations, and extend ITS coverage to the full corridor (FPIC/SMP #1-3).	●	●	○	○	○	○	○	○	○	○	○	○	○	○	\$0.5 per person-hour of delay saved
	8	East County Ramp Metering: SR-4 EB and WB Ramp Metering between SR-160/SR-160 and I-680 (FPIC/SMP #4-7).	●	●	○	○	○	○	○	○	○	○	○	○	○	○	\$1.17 per person-hour of delay saved
	22	Control Point Metering: At Kicker Pass Rd/Norfolkville Rd and James Donlon Blvd/Ventura Rd.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$-0.55 per person-hour of delay saved
	24	Arterial Signalization Improvements: Signal Improvements on Railroad Ave.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved
	26	Communication equipment for signal synchronization on E Leland Rd and Delta Fair Blvd.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved
	28	Loveidge Rd/Leland Rd Intersection Improvements.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$0 person-hour of delay saved
	29	Antioch Ferry Service: Ferry service to San Francisco.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$8.08 per person-hour of delay saved
	23	James Donlon Blvd Extension: James Donlon Blvd Extension between Somerville Rd and Kicker Pass Rd. Construct new two-lane roadway, 2.2 miles in length with a 60 mph design speed.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$204 per person-hour of delay saved
	34	SR-4 Bypass Widening: Widen from 2 lanes to a 4-lane expressway from Laurel Rd to Sand Creek Rd.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$522 per person-hour of delay saved
	35	Sand Creek Rd Interchange construction.	●	○	○	○	○	○	○	○	○	○	○	○	○	○	\$522 per person-hour of delay saved

Projects may be rearranged in the future as project development occurs and funding plans are identified. Subject to review by the RTPCs.

LEGEND:

Qualitative:
 ● "More Favorable" ○ "Less Favorable"
 * Note: Non-recurrent

This Page Intentionally Left Blank

Table 8 - Long-Term East County Projects

Year	ID	Project	Qualitative Measures							Quantitative Measures					
			Multi-Modal Access, Mobility, and Reliability				SUS			Mobility Improvements					
			Freeway Operational Improvement	Enhance Transit Service	Improve Transit Speed	Improve Efficiency Through Signal Timing and Ramp Metering	Better Access to Jobs and Housing	Reduce per-capita CO ₂ Emissions	Reduce VMT	Reduce Particulate Emissions	Increase Walking and Biking	Annual Reductions in Total Delay (Recurrent and Non-Recurrent-hr)	Cost Effectiveness		
		East County Parallel Arterial Improvements:													
	50	Willow Pass Rd Widening from Bailey Rd to Pittsburg City Limits.	●	○	○	○	●	○	○	○	○	○	○	○	
	51	Willow Pass Rd Widening from Range Rd to Loftus Rd.	●	○	○	○	●	○	○	○	○	○	○	○	
	54	California Ave Widening from Railroad Ave to Lovetidge Rd.	●	○	○	○	●	○	○	○	○	○	○	○	
	56	Pittsburg-Antioch Hwy Widening from 2 to 4 lanes between Somersville and Lovetidge Rd.	●	○	○	○	●	○	○	○	○	○	○	○	
	57	West Tregallas Rd/Fitzuren Rd Widening from 2 to 4 lanes.	●	○	○	○	●	○	○	○	○	○	○	○	
		Pittsburg/Bay Point BART Station Area Improvements:													
	47	Bailey Rd/Leland Rd Intersection Improvements.	●	○	○	○	●	○	○	○	○	○	○	○	
	48	Bailey Rd/Willow Pass Rd Intersection Improvements.	●	○	○	○	●	○	○	○	○	○	○	○	
	49	Bailey Rd Protestant Interchange Improvements and Design Modifications.	●	○	○	○	●	○	○	○	○	○	○	○	
		East County Intersection Improvements:													
	52	Railroad Ave/Leland Rd Intersection Improvements.	●	○	○	○	●	○	○	○	○	○	○	○	
	53	Railroad Ave/EB SR-4 Ramps Intersection Improvements.	●	○	○	○	●	○	○	○	○	○	○	○	
	55	Buchanan Rd/Lovetidge Rd Intersection Improvements.	●	○	○	○	●	○	○	○	○	○	○	○	
		SR-4 Ramp Metering:													
	60	On the SR-4 Bypass (FPIC/SMP #3).	●	○	○	○	●	○	○	○	○	○	○	○	
		On the SR-4 Bypass (FPIC/SMP #14).	●	○	○	○	●	○	○	○	○	○	○	○	
		SR-4 Bypass:													
	58	SR-4 Bypass/SR-160 Northbound Connector.	●	○	○	○	●	○	○	○	○	○	○	○	
	59	SR-4 Bypass/SR-160 Southbound Connector.	●	○	○	○	●	○	○	○	○	○	○	○	
	61	Widen (number of lanes varies) and improve the "old" SR-4 arterial from SR-160 to Marsh Creek Rd.	●	○	○	○	●	○	○	○	○	○	○	○	
	62	SR-4 Bypass, Segment 1: Widen from 4 to 6 lanes between SR-160 and Lone Tree Way.	●	○	○	○	●	○	○	○	○	○	○	○	
	63	SR-4 Bypass, Segment 2: Widen from 2 lanes to a 4-lane expressway between Sand Creek Rd and Bailfour Rd.	●	○	○	○	●	○	○	○	○	○	○	○	
	64	SR-4 Bypass, Segment 3: Bailfour Rd interchange Improvements.	●	○	○	○	●	○	○	○	○	○	○	○	

Projects may be rearranged in the future as project development occurs and funding plans are identified.

Subject to review by the RTPCs.

LEGEND:

Qualitative:

● "More Favorable" ○ "Less Favorable"

● Favorable ○ Not Favorable

● More Favorable ○ Less Favorable

● Note: Non-Occurrent

This Page Intentionally Left Blank

Section 4: Multimodal Transportation Service Objectives

As described in the Introduction, the RTPCs have each developed Action Plans that include Multimodal Transportation Service Objectives (MTSOs) to use as performance measures for their planning activities. According to the Growth Management Plan Program *Implementation Guide*:

"Action Plans include adopted MTSOs using a quantifiable measure of effectiveness and including a target date for attaining the objective (e.g., minimum intersection Level of Service, maximum travel time delays, auto occupancy targets, and transit use). The adopted MTSOs should also be able to serve as "thresholds of significance" in the CEQA review of a proposed project or General Plan amendment (GPA)."

The following sections discuss existing and future performance related to the MTSOs in each planning area in the corridor.

Overview of Performance Measures

Performance measures are used to monitor transportation systems and are important to the decision-making process. They are used to monitor whether congestion, average speeds, system reliability, and mobility options have changed over time. Level of Service (LOS) and delay index are two performance measures used to monitor the SR-4 corridor.

Level of Service (LOS)

LOS is a measure of traffic operating conditions based on volume and capacity as calculated using the Highway Capacity Manual (HCM). Roadway LOS range from LOS A, which indicates free flow or excellent conditions with short delays, to LOS F, which indicates congested or overloaded conditions with extremely long delays. LOS A through LOS D is considered excellent to satisfactory service levels, LOS E is undesirable, and LOS F conditions are representative of gridlock.

Delay Index

Delay Index is an expression of the amount of time required to travel a segment of road during the peak commute hour as compared to non-peak hours in a single direction. The measure is calculated by dividing peak travel time by non-peak travel time.

Delay Index = Peak Travel Time/Non-Peak Travel Time

A Delay Index of 1.0 indicates that the traffic moves at free-flow speed, unconstrained by congestion and not exceeding the posted speed limit. As congestion increases and average speed decreases, the Delay Index rises. A Delay Index of 2.0 indicates that the trip takes twice as long during peak hours as during non-peak hours.

West County

The MTSO for SR-4 in West County is: **maintain LOS "E" or better on all segments for SR-4.** WCCTAC has also adopted numerous area-wide goals which may have some relevance to the corridor:

- Maintain a drive alone rate during peak periods of less than 75 percent system-wide.
- Increase West County transit ridership by 10 percent between year 2007 and 2012.
- Increase bicycle and pedestrian mode splits to 3 percent for commute trips by 2012.
- Maintain a 3,000/day ridership on the Capitol Corridor route by year 2012.
- Achieve 500/day ridership on the Richmond-San Francisco ferry line by 2012.
- Achieve 500/day ridership on the Hercules-San Francisco ferry line by 2012.
- Maintain 2007 on-time performance for buses.

These quantitative goals apply to the entire planning area, and it is difficult to ascribe a portion of these targets to the SR-4 corridor, particularly for those items related to specific transit routes that are outside of the corridor. Accordingly, the focus for this study is only on the direct facility performance of SR-4.

Current performance on the West County portion of SR-4 is at LOS C Eastbound and LOS B Westbound. Without implementing any of the projects evaluated in this study, future baseline performance on SR-4 in West County is LOS C Eastbound and LOS B Westbound in the Short-Term and LOS D Eastbound and LOS C Westbound in the Long-Term. If the full package of proposed improvements is implemented, the performance would be LOS C Eastbound and LOS B Westbound in the Short-Term and LOS C for both Eastbound and Westbound in the Long-Term, see Table 9.

Table 9 - West County LOS

	Current	Future Baseline		Proposed Improvements	
		Short-Term	Long-Term	Short-Term	Long-Term
Eastbound	C	C	D	C	C
Westbound	B	B	C	B	C

Central County

The MTSO for SR-4 in Central County established by TRANSPAC is to achieve and maintain a Delay Index⁷ of 5.0 from Cummings Skyway (WCCTAC boundary) to Willow Pass (TRANSPLAN boundary).

Current performance on the Central County portion of SR-4 is at a Delay Index of 1.3 Eastbound and 1.3 Westbound. Without implementing any of the projects evaluated in this study, future baseline performance on SR-4 in Central County is a Delay Index of 2.7 Eastbound and 1.7 Westbound in the Short-Term and 4.1 Eastbound and 1.9 Westbound in the Long-Term. If the full package of proposed improvements is implemented, the performance would improve to a Delay Index of 1.2 Eastbound and 1.2 Westbound in the Short-Term and 1.2 Eastbound and 1.3 Westbound in the Long-Term, see Table 10.

Table 10 - Central County Delay Index

	Current	Future Baseline		Proposed Improvements	
		Short-Term	Long-Term	Short-Term	Long-Term
Eastbound	1.3	2.7	4.1	1.2	1.2
Westbound	1.3	1.7	1.9	1.2	1.3

East County

TRANSPLAN has established two MTSOs that related explicitly to SR-4:

- Achieve and maintain a Delay Index of 2.5 in the AM or PM Peak Periods.
- HOV lane utilization should exceed 600 vehicles per lane in the peak direction at peak hour.

The RTPC has also established the following MTSOs for adjacent arterials and nearby transit service:

- Bailey Road: Peak hour V/C ratio at signalized intersections should be less than or equal to 0.99 (LOS E).
- All Other Signalized Suburban Arterials (excepting Bailey Road): Peak hour V/C ratio at signalized intersections should not be worse than 0.85 (mid level-of-service D) based on the Authority's method of LOS analysis.
- Traffic Management Program Sites: Buchanan Road, Railroad Avenue, and Kirker Pass Road: System delay index of 1.54 and corridor delay index for Buchanan Road of 1.88.
- Transit Productivity Target (bus): 12 riders per revenue service hour.
- Transit Productivity Target (BART): 4,000 daily BART riders west of Bay Point Station.

⁷ The Delay Index is an expression of the amount of time required to travel between two points during the peak hour as compared to non-peak hours. The measure is calculated by dividing peak travel time by non-peak travel time.

Current performance on the East County portion of SR-4 is at a Delay Index of 1.5 Eastbound and 2.6 Westbound. Following the completion of the SR-4 widening and e-BART, future baseline performance on SR-4 in East County is a Delay Index of 1.1 Eastbound and 1.9 Westbound in the Short-Term and 1.5 Eastbound and 3.6 Westbound in the Long-Term. If the full package of proposed improvements is implemented, the performance would improve to a Delay Index of 1.1 Eastbound and 1.1 Westbound in the Short-Term and 1.2 Eastbound and 1.3 Westbound in the Long-Term, see Table 11.

Table 11 - East County Delay Index

	Current	Future Baseline		Proposed Improvements	
		Short-Term	Long-Term	Short-Term	Long-Term
Eastbound	1.5	1.1	1.5	1.1	1.2
Westbound	2.6	1.9	3.6	1.1	1.3

Section 5: Recommendations/Conclusions

During the course of this study, a number of new projects were identified for consideration that had not been well defined in earlier planning documents. In particular, several projects related to the interchange of I-680 and SR-4, collectively known as Scenario 5, were designed as an enhancement on earlier proposals for that segment. TRANSPAC recommended that Scenario 5 be established as a project in Contra Costa and added to the Comprehensive Transportation Project List (CTPL) and the Countywide Transportation Plan. Scenario 5 consists of the following projects depicted in Figure 8:

- An eastbound mixed-flow lane from San Marco Blvd off-ramp to San Marco Blvd on-ramp;
- An eastbound mixed-flow lane from east of SR-242 on-ramp to San Marco Blvd off-ramp; and
- An eastbound HOV lane from NB I-680 on-ramp to the start of the HOV lane 1,500 feet west of Port Chicago Highway off-ramp.

Together with the other proposed capacity enhancements on SR-4 in the same general area, these projects perform well on both quantitative and qualitative metrics.

Total Project Costs

As part of this project, the study team documented and updated cost estimates for all of the proposed projects. Estimates were prepared in 2011 dollars, and summed by time horizon (Short-Term vs. Long-Term) for each planning area. The total costs for all projects evaluated in the study are provided below in Table 12.

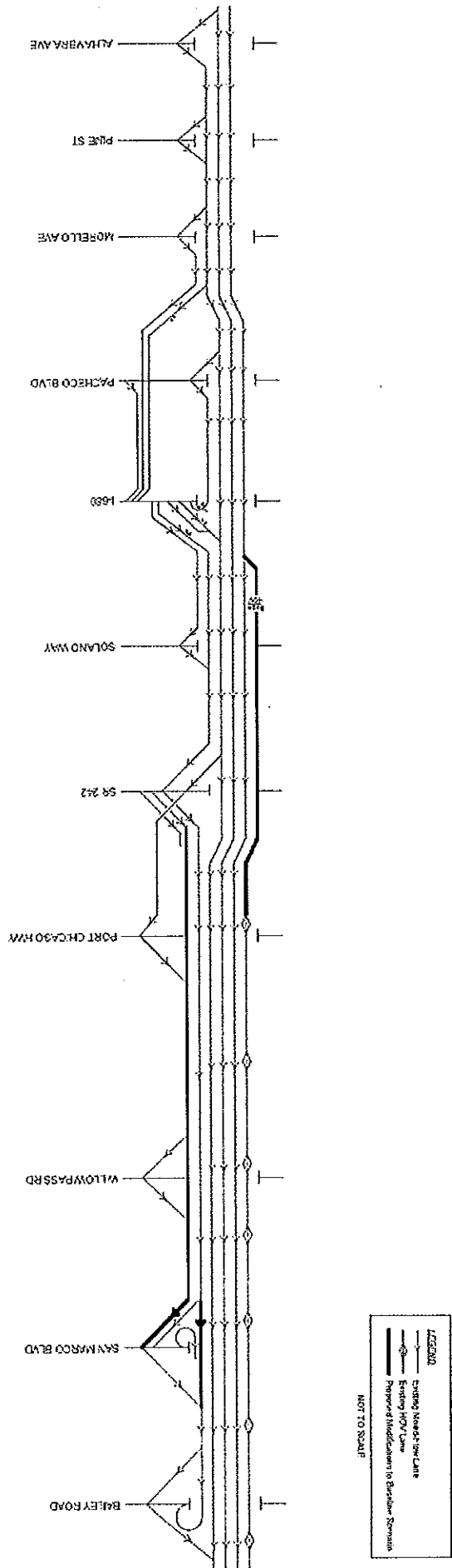
Table 12 - Total Cost for All Projects (2011\$ - millions)

<i>Planning Area</i>	<i>Short-Term: 2015-2020</i>	<i>Long-Term: 2020-2030</i>	<i>TOTAL</i>
West	\$210	\$791*	\$1,002
Central	\$344	\$386	\$730
East	\$164	\$360	\$524
Total	\$718	\$1,537	\$2,256

*Includes \$454 million for WBART

The total cost for these projects (\$2.256 billion) far exceeds available funding for transportation improvements in the corridor. It is likely that obtaining the necessary funding to implement the projects proposed in this study will require coordination with local jurisdictions, regional partners, and potentially state and federal sources as well. The ability to fully fund a particular project may be largely determined by its fit with the priorities and criteria of available funding sources rather than its localized performance ranking in the corridor. However, to the extent that local jurisdictions and decision-making bodies have discretionary authority over expenditures, the results of this study provide information about the relative benefits available by choosing to fund different potential projects. It should be noted that West County total projects costs are higher as more transit projects are proposed for this planning area.

Figure 8 – Lane Diagram of Proposed Scenario 5



Implementation Considerations

In addition to the constraint of funding availability, stakeholders highlighted how other considerations will likely shape the priorities for project implementation within the corridor. These considerations include geographic and modal balance and the network impacts of project phasing.

For example, during the project evaluation, it was quickly recognized that many of the transit-related projects in West County do not have a strong impact on performance in the SR-4 corridor. This is largely because the transit network is primarily oriented north-south along the I-80 corridor rather than serving the east-west movements that parallel the SR-4 freeway. This should not be construed as an indication that transit projects are not important or beneficial for the West County planning area. On the contrary, transit can serve many important purposes, including congestion relief along the I-80 corridor. It is important to balance the needs of multi-modal users in different corridors and this could suggest a slightly different prioritization of projects than highlighted by this study, which was exclusively focused on a single corridor.

Another key point raised by the project stakeholders is the need to prioritize projects based on a logical phasing plan. Specifically, a project that improves operations through capacity expansion may have the largest potential for congestion relief, but if it is located between two other segments that are congested, its utility as a standalone project is diminished. In order to ensure a continuous and smooth traffic flow on the improved segment that does not create new bottlenecks, implementing the middle project may not be advisable until the downstream project is completed. Similarly, reconstructing a major interchange that will include HOV-to-HOV flyover ramps may be premature if the connecting HOV lanes on the mainline are not yet completed. Thus, the project evaluation should be viewed as informing potential implementation trade-offs, rather than dictating the timing for construction in the years ahead.

MTSOs and Action Plans

At the outset of the SR-4 ICA, it was anticipated that the results of the project evaluation might suggest a re-prioritization of projects within each planning area or across the corridor as a whole. In addition, one of the goals of the study was to see whether the proposed set of projects could enable additional harmonization of MTSOs across the corridor. Harmonization of MTSOs could have required amendments to the Action Plans for Routes of Regional Significance. Instead, this study affirmed that current priorities and metrics within the Action Plans are sufficient for the time being, and that no amendments will be required.

Next Steps

The projects in the SR 4 ICA include traffic and freeway operational enhancements, freeway and interchange improvements, transit projects, and projects that support PDAs. Some projects are "on the books", or recognized by county and regional transportation plans, while others are new projects that evolved through the process of developing the ICA. The projects outlined in the ICA provide a comprehensive vision for the next generation of transportation improvements for the SR-4 corridor.

Regardless of the type of project – freeway, operations or transit – there is a common framework for the next steps that need to be taken. In general this involves prioritizing and recognizing these projects at the RTPC level, incorporating projects into the Authority's Countywide Transportation Plan, conducting any technical studies necessary to prepare strategic funding plans, advancing projects in the regional transportation planning process, and finally, project delivery. Each of these steps is discussed briefly as follows.

RTPC Approval and Prioritization – Three RTPC's – WCCTAC, TRANSPAC, and TRANSPLAN – are located along the SR-4 corridor studied in the ICA. Each is facing unique transportation challenges in the future. For instance East County projects include traffic operational improvements to adjacent arterials and improvements supporting the needs of PDA's while West County is concentrating on multi-modal opportunities that support PDA development in the area of the SR 4 / I-80 interchange. Central County is clearly focused on advancing the important SR 4/I-680 interchange and SR-4 widening.

Because of these varying perspectives, each area of Contra Costa County may look at and prioritize projects by emphasizing, or weighting the performance metrics presented in the ICA differently. RTPC prioritized projects will need to be furnished to CCTA for evaluation in the Countywide Transportation Plan.

Countywide Transportation Plan Evaluation and Technical Studies – Prioritized project lists forwarded by each of three RTPC's located along SR-4 then need to be evaluated from an overall, countywide perspective. To support these evaluations technical studies may need to be conducted for new projects that have been in the plan previously or not previously defined in sufficient detail. The technical studies should be complete enough so that the projects are defined and planning level estimates of probable costs identified.

Strategic Funding Plans and the Regional Transportation Planning Process -- The technical studies will serve as input to the development of strategic funding plans for projects that advance through the Countywide Transportation Plan process. Funding could be local Measure J monies, or more likely a combination of funding through local, regional, state and federal sources. Projects that meet the needs of the RTPC and CCTA planning process, measure well regional transportation planning metrics, and have broad support based on reasonable expectations of joint funding should be eligible for inclusion in the financially constrained element of the Regional Transportation Plan (RTP).

Project Delivery Process – Projects that are included in the RTP can proceed to the appropriate project delivery process which can vary depending on the scope and type of project. Ramp metering projects can be delivered with a minimal project delivery process that includes technical and monitoring studies. More complicated freeway projects will need to comply with the Caltrans project delivery process. For instance the step of the project delivery process for the SR-4 improvements east of the SR4/I-680 interchange referred to as Scenario 5 in this report or identified in the SR-4 FPI/CSMP would be the completion of a Caltrans Project Study Report followed by the preparation of environmental clearance documents, engineering design, right-of-way procurement, and construction. Transit projects that rely upon federal funds will need to be conducted according to the Federal Transit Agency New or Small Starts processes. These processes, which extend through design and the preparation of ready-to-let plans, may be completed by local cities, CCTA, transit agencies, or Caltrans.

Appendix B: Evaluation Matrix

Project			Quantitative Measures											Qualitative Measures													
Year	ID	Project Description	Multimodal Access, Mobility and Feasibility					Reduce VMT					Reduce GHG Emissions		Health and Safety		Cost Effectiveness		Qualitative Score	Total Score							
			System Connectivity	Service Operational Improvement	Service Reliability	Service Frequency	Service Accessibility	Reduce VMT (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)	Reduce GHG Emissions (Millions)			Reduce GHG Emissions (Millions)						
2015 - 2020	1	West County ITS Implementation: Fill gaps in the current and programmed, and extend ITS coverage to the full corridor (P/C/S/P/R-3).	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
2015 - 2020	2	Capital Center Service: Increased Richmond-Hercules service along the existing Capital Center rail line.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		
2015 - 2020	3	Hercules Ferry Service and Inland Station: Hercules Ferry Service from Hercules to San Francisco.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
2015 - 2020	4	West County Range Riders: SPC-4 EB and WB Ramp Merging between I-80 and I-680 (P/C/S/P/R-3/4).	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
2015 - 2020	5	WABART: Operate rail services from Hercules to the Richmond BART station.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
2020 - 2030	38	Ultimate I-80/SP-4 Interchange Improvements: Widens I-80 WB on-ramp from 1 to 3 lanes at John Muir Parkway and construct bypass connector ramps from NB I-80 to WB SP-4 and from SB I-80 to EB SP-4.	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
2020 - 2030	39	Widow Ave Ramp Replacement: Reconstructed the WB ramp as diagonal ramp.	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
2020 - 2030	40	State Route 4 West, Contract to full Freeway Standard: Upgrade SR-4 from an expressway to a freeway between I-68 and Cunniffing Skyway.	●	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○

Projects may be re-ranked in the future as project development occurs and funding plans are identified. Evaluation does not dictate a particular action in years ahead. Scores are not included. Subject to review by the RTP/C.

LEGEND: Qualitative: *More Favorable = 2, *Favorable = 1, *Least Favorable = 0

Quantitative: cost effectiveness (e.g.) <\$5 = 4, ca. \$5 - \$10 = 3, ca. \$10 - \$15 = 2, and ca. 0 - >\$15, or negative = 0

* Note: Non-recurrent

Central County Projects		Performance Measures on SR-4										Qualitative Measures				Quantitative Measures									
Year	ID	Project	System Continuity	Fleet/Operational Improvements	Signage/Traffic Services	Improve Throughput/Reduce Delays	Efficient Training and Safety	Reduce Access to Obstructed Hoopings	Reduce per-capita CO2 Emissions	Reduce PM10	Reduce Particulate Emissions	Increase Motorist Satisfaction	Qualitative Score	Baseline 2015	Average Speed (mph)	Average Travel Time (min)	Annual Reduction in Total Delay (hours)	Annual Reduction in Total Delay (hours)	Cost (in millions)	Cost Effectiveness	Cantonese Score	Total Score	Risk		
																								Cost Effectiveness (ca.)	Cantonese Score
	1	Central County ITS installations:																							
	1	Fit gaps in the current and programmed, and extend ITS coverage to the full corridor (PP/CSSMP #1-3).	●	●	○	○	●	●	○	○	○	○	10	38	32	3,677,138	\$	15.50	\$0.8 per person-hour of delay saved	4	14	2			
	0	Maintain Emergency Service and Intermodal Stations; replace, vehicles, and pedestrian bridges.	●	○	●	○	○	○	○	○	○	7	38	32	4,641	\$	86.20	\$55 per person-hour of delay saved	0	7	3				
	7	Ferry services between Mendocino and San Francisco.																							
	7	SR-4 EB Widening from 1480 to Willow Pass Rd (East):																							
	8	SR-4 EB Ramping Widening between Richardson Ave and Willow Pass Rd (PP/CSSMP #17).																							
	18	Extend the existing EB mixed-flow lane from Willow Pass Rd (East) to two lanes located east of Willow Pass Rd (East) (PP/CSSMP #12).																							
	17	EB mixed-flow lane from San Marco Blvd off-ramp to San Marco Blvd on-ramp (Scenario 5).																							
	14	Extend the EB mixed flow lane from the same drop at Port Chicago Hwy to Willow Pass Rd (West) (PP/CSSMP #6).																							
	13	EB mixed-flow lane from east of SR-242 on-ramp to San Marco Blvd off-ramp (Scenario 5).																							
	10	1480/594 Interchange Improvement Project - Phase III ("Spooling" change) - 3rd EB mixed-flow (filled) lane from Mendocino Ave to east of SR 242.																							
	12	EB FICV lanes from NB/EB on-ramp to the start of the HOV lane 1,500 feet west of Port Chicago Highway off-ramp (Scenario 5).																							
	11	SR-4 NB Widening at Willow Pass Rd (East) to 1480:																							
	11	1480/594 Interchange Improvement Project - Phase III 3rd WB mixed-flow (filled) lane from SR-242 off-ramp to Mendocino Ave.																							
	15	Extend the existing WB mixed-flow lane from the Willow Pass Rd (West) off-ramp to the two-lane east of Port Chicago Hwy off-ramp (PP/CSSMP #6).																							
	16	Extend the existing WB mixed-flow lane from the two drop lanes at Willow Pass Rd (East) off-ramp to Willow Pass Rd (West) off-ramp (PP/CSSMP #6).																							
	21	Kicker Pass Rd Truck Climbing Lane.																							
	21	From Checkpoint Drive to 102nd east of E Hines Rd (WB).																							

Projects may be rearranged in the future as project development occurs and funding plans are identified. Subject to review by the RTPCs.

LEGEND:
 Qualitative:
 * "More Favorable" = 2 * "Favorable" = 1 * "Less Favorable" = 0

Quantitative:
 cost effectiveness (ca.) < \$5 = 4, ca. \$5 - \$10 = 3, ca. \$10 - \$15 = 2, and ca. 0 - \$15, or negative = 0

Note: Non-recurrent

Central County Projects																				
Performance Reasons on SR4																				
Year	ID	Project	System Contingency	Utility/Operational	Enhance Transit Service	Improve Through-Street Traffic and Street Lighting	Reduce Access to Jobs and Housing	Reduce per-capita CO2 Emissions	Reduce Particulate Emissions	Increase Multimodal Options	Qualitative Score	Quantitative Measures				Annual Reduction in 2038 Delay (person-hour)	Annual Reduction Cost (in millions)	Cost per person-hour of delay saved	Qualitative Score	Performance Reason
												Average Speed (mph)	Average Travel Time (min)	Annual Reduction in 2038 Delay (person-hour)	Annual Reduction Cost (in millions)					
2020 - 2030	41	Alamogordo Ave Safety Improvement: Concrete and 55 inch from Main Ave to Franklin Canyon Rd.	●	○	○	○	○	○	○	○	Baseline 2038: 2	31	66	13,894,035	\$ 1.90	\$9 person-hour of delay saved	0	2	4	
	42	Pacheco Boulevard Widening: Widening from 2 to 4 lanes from Blum Rd to Manole Ave with a new raised overpass.	●	○	○	○	○	○	○	○	3	31	66	0	\$ 37.80	\$9 person-hour of delay saved	0	3	3	
		448055-4 Interchange Improvement	●	○	○	○	○	○	○	○	14	44	49	1,990,000	\$ 396.89	\$162 per person-hour of delay saved	0	14	1	
	43	Project - Phases I, II, IV - Concrete direct connector	●	○	○	○	○	○	○	○	7	40	56	949,203	\$ 56.69	\$6.58 per person-hour of delay saved	3	10	2	
	44	448055-4 Interchange HOV direct connector ramp.	●	○	○	○	○	○	○	○										
	45	Parallel Arterial Improvement: Edison Esora Rd from Willow Grove Rd to Post Chicago Hwy.	●	○	○	○	○	○	○											
	46	Edison Westland Rd to Willow Grove Rd	●	○	○	○	○	○	○											

Projects may be rearranged in the future as project development occurs and funding plans are identified. Subject to review by the RTPCA.

LEGEND:
 Qualitative:
 *"More Favorable" = 2 "Favorable" = 1 "Less Favorable" = 0

Quantitative:
 cost effectiveness (ca) <\$5 = 4, ca. \$5 - \$10 = 3, ca. \$10 - \$15 = 2, and ca. 0 - >\$15, or negative = 0

* Note: Non-recurrent

East County Projects
Performance Measures on SR-4

ID	Project	Qualitative Measures										Baseline 2015		Quantitative Measures									
		Station Reliability	Emergency Operations	Enhanced Transit Services	Access to Transit	Improve Transit Reliability	Reduce Transit Delay	Reduce Transit Delay	Reduce Transit Delay	Reduce Transit Delay	Reduce Transit Delay	Reduce Transit Delay	Baseline 2015	Baseline 2015	Annualized Person-Hour Reduction (PHR)	Annualized Person-Hour Reduction (PHR)	Annualized Person-Hour Reduction (PHR)	Annualized Person-Hour Reduction (PHR)	Annualized Person-Hour Reduction (PHR)	Annualized Person-Hour Reduction (PHR)	Annualized Person-Hour Reduction (PHR)		
1	East County ITS Installation: Full scope in the contract and programmed ITS installation, and count ITS coverage to the full center (FPOC/SMP #10).	●	●	○	○	●	○	○	○	○	○	○	Baseline 2015	59	28	3,477,138	28	144,894*	\$	16.70	\$0.5 per person-hour of delay saved		
2	East County Ramp Metering: SR-4 EB and WB Ramp Metering between SR-160 and I-805 (FPOC/SMP #4-7).	●	●	○	○	●	○	○	○	○	○	Baseline 2015	51	28	405,827	28	405,827	\$	12.20	\$1.17 per person-hour of delay saved			
3	Correct Road Markings: At Kiefer Pass Redwoodville Rd and James Center Blvd Yuba City.	●	○	○	○	○	○	○	○	○	○	Baseline 2015	45	22	-2,951	22	-2,951	\$	0.80	±0.25 per person-hour of delay saved			
4	Material Signalization Improvements: Signal improvements on Railroad Ave.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	53	28	0	28	0	\$	0.80	\$0 per person-hour of delay saved			
5	Communication equipment for signal synchronization on El Estero Rd and Delta Fair Blvd.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	53	28	0	28	0	\$	0.80	\$0 per person-hour of delay saved			
6	Lowridge Redwood Rd Intersection Improvements: Autotech Ferry Service: Ferry service to San Francisco.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	53	28	1,451	28	1,451	\$	0.80	\$0.08 per person-hour of delay saved			
7	James Dodson Blvd Extension: James Dodson Blvd Extension between Sacramento Rd and Kiefer Pass Rd. Construct new two-lane roadway, 2.2 miles in length with a 60 mph design speed.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	55	26	132,002	26	132,002	\$	42.80	\$204 per person-hour of delay saved			
8	SR-4 Bypass Widening: SR-4 Bypass Widening: Widened from 2 lanes to a 4-lane expressway from Laurel Rd to Sand Creek Rd.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	52	27	28,859	27	28,859	\$	60.00	\$252 per person-hour of delay saved			
9	East County Parallel Arterial Improvements: East County Parallel Arterial Improvements: Willow Pass Rd Widening from Bailey Rd to Pittsburg City Limits.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	41	55	13,589,005	55	13,589,005	\$	48.40	\$4.67 per person-hour of delay saved			
10	Willow Pass Rd Widening from Rango Rd to Colina Rd, California Ave Widening from Railroad Ave to Leavitt Rd.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	43	52	012,811	52	012,811	\$	48.40	\$4.67 per person-hour of delay saved			
11	Pittsburg-Autotech Hwy Widening from 2 to 4 lanes between Sacramento and Lowridge Rd.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	43	52	012,811	52	012,811	\$	48.40	\$4.67 per person-hour of delay saved			
12	West Tropicana Redwood Rd Widening from 2 to 4 lanes.	○	○	○	○	○	○	○	○	○	○	Baseline 2015	43	52	012,811	52	012,811	\$	48.40	\$4.67 per person-hour of delay saved			

Projects may be re-ranked in the future as project development occurs and funding plans are identified. Evaluation does not dictate a particular action in years ahead. Scores are not included. Subject to review by the RTPCs.

LEGEND:
Qualitative:
● "More Favorable" = 2, ○ "Favorable" = 1, ○ "Less Favorable" = 0

Quantitative:
cost effectiveness (ca.) < \$5 = 4, ca. \$5 - \$10 = 3, ca. \$10 - \$15 = 2, and ca. 0 - \$515 or negative = 0

* Note: Non-recurrent

East County Projects													
Performance Measures on SR-4													
Year	ID	Project	Quantitative Measures								Qualitative Measures		
			System Condition	Emergency Operations Improvements	Enhance Public Services	Improve Traffic Flow	Improve Safety Through Signal Timing and Ramp Metering	Reduce Access to Congested Areas and Reduce Accidents	Reduce Vehicle Emissions	Reduce Pedestrian Injuries	Increase Walking and Biking	Annual Predictive Roadway Condition Score (0-100)	Annual Predictive Roadway Safety Score (0-100)
	47	Phiburg/Polina BART Station Area Improvements:											
	48	Balboa Redwood Rd Intersection Improvements:	●	○	●	○	●	○	○	○	○	○	○
	49	Balboa Redwood Rd Intersection Improvements: Balboa Rd/Redwood Rd Intersection Improvements and Drainage Modifications:	●	○	●	○	●	○	○	○	○	○	○
	50	East County Intersection Improvements:											
	51	Redwood Road/Redwood Rd Intersection Improvements:	●	○	●	○	●	○	○	○	○	○	○
	52	Redwood Road/Redwood Rd Intersection Improvements:	●	○	●	○	●	○	○	○	○	○	○
	53	Redwood Road/Redwood Rd Intersection Improvements:	●	○	●	○	●	○	○	○	○	○	○
	54	Redwood Road/Redwood Rd Intersection Improvements:	●	○	●	○	●	○	○	○	○	○	○
	55	Balboa Rd/Redwood Rd Intersection Improvements:											
2020 - 2030	SR-4 Ramp Metering:												
	00	On the SR-4 Bypass (FRCS&M 103):	●	○	●	○	●	○	○	○	○	○	○
	01	On the SR-4 Bypass (FRCS&M 104):	●	○	●	○	●	○	○	○	○	○	○
	02	SR-4 Bypass:											
	03	SR-4 Bypass SR-160 Northwest Connector:											
	04	SR-4 Bypass SR-160 Southwest Connector:											
	05	SR-4 Bypass SR-160 Southwest Connector:											
	06	Wilson (number of lanes added) and improve the SR-4 from SR-160 to Mount Creek Rd:	●	○	●	○	●	○	○	○	○	○	○
	07	SR-4 Bypass, Segment 1: Wilson from 4 to 6 lanes between SR-160 and Lowry Trunk Way:	●	○	●	○	●	○	○	○	○	○	○
	08	SR-4 Bypass, Segment 2: Wilson from 2 lanes to a 4 lane roadway between Sand Creek Rd and Balboa Rd:	●	○	●	○	●	○	○	○	○	○	○
	09	SR-4 Bypass, Segment 3: Balboa Rd Interchange Improvements:											

Projects may be reexamined in the future as project development occurs and funding plans are identified. Evaluation does not dictate a particular action in years ahead. Scores are not included. Subject to review by the RTPCC.

LEGEND:
 Quantitative:
 * More favorable = 2 ○ favorable = 1 ○ less favorable = 0

Quantitative:
 cost effectiveness (ca) < \$5 = 4, ca. \$5 - \$20 = 3, ca. \$20 - \$35 = 2, and ca. 0 - \$35, or negative = 0

* Note: Non-recurrent

